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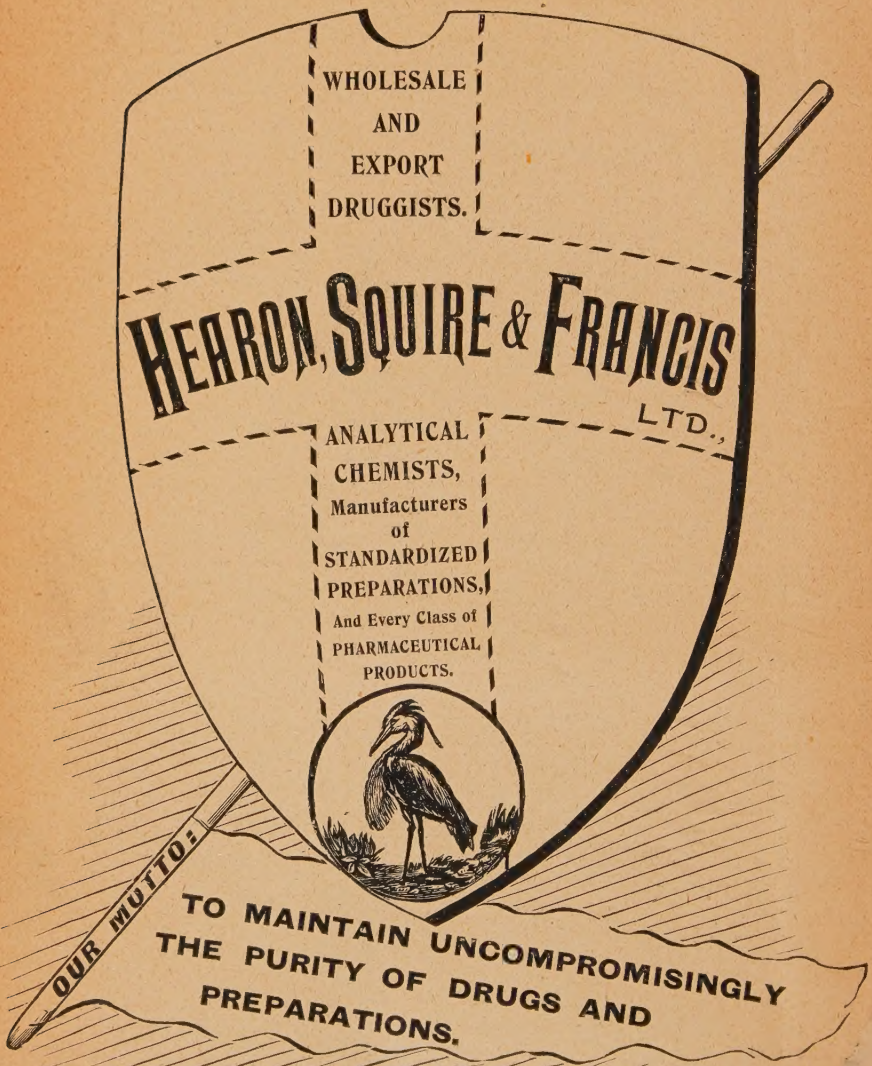

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THE

BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

The most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meeting for 1901 will be held at Dublin.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretaries, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is *7s. 6d.* for members residing within the Postal Union. Further information may be obtained from

The Asst. Secretary, Brit. Pharm. Conf.,
17, Bloomsbury Square, London, W.C.

THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 245.

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INTRODUCTION.

Among the contributions to the scientific literature of the year, which have found a place in this volume, we may fitly select some recent work in connection with the chemical elements as a starting point in the brief summary we intend to give in this introductory chapter. Considerable interest attaches to the discovery of several new elements possessing a high degree of radio-activity. These discoveries are the more or less direct outcome of Becquerel's observation that certain uranium and thorium compounds possess the property of emitting rays which affect a sensitive photographic plate, and that this property is not merely due to the phosphorescence acquired by exposure to light, but that it is as strongly marked after the substances referred to have been kept in the dark for a long time. Two highly radio-active new elements, *radium* and *polonium*, occurring in impure barium chloride and in pitchblende respectively, are now reported upon by P. and S. Curie and G. Bémont, and are shown to greatly exceed uranium and thorium in their photographic effects on sensitive plates. More recently still another new element of this class, to which the name *actinium* is given, has been extracted from pitchblende by A. Debierne. *Victorium*, a new element associated with yttrium, has been discovered in the earths of the cerium group by Sir W. Crookes, who states that the anhydrous sulphate, and to some extent also the oxide of this element, possess marked phosphorescent properties.

The liquefaction of hydrogen, which was accomplished two years ago by J. Dewar, has been promptly followed by the successful solidification of this element by the same investigator. He has obtained it in the form of a transparent ice-like mass, showing no trace of metallic appearance.

The amount of total iodine present in sea water collected at different depths is found by A. Gautier to show little or no variation, whereas great differences exist in the various strata in the proportion of this element occurring in the form of inorganic

and of insoluble organic compounds. Minute traces of iodine have been detected by the same author in the atmosphere both at Paris and at the sea coast; but they seem to be confined to the dust suspended in the air, in which they probably exist organically combined in small vegetable organisms.

The explosive product obtained in the action of ammonia on iodine has been further investigated with regard to its composition by C. Hugot, who describes a green crystalline compound of the formula $NI_3 3NH_3$, and represents the reaction by the equation $16NH_3 + 6I = 3(NH_4I \cdot 3NH_3) + NI_3 3NH_3$. From this green compound he has obtained a yellowish white one of the formula $NI_3 2NH_3$, and a violet one of the formula $NI_3 NH_3$, by keeping it in vacuo at different temperatures. A new nitrogen iodide of the composition N_3I is reported upon by A. Hantzsch. The action of iodine on alkalies has been re-investigated by R. L. Taylor, who arrives at the conclusion that the initial change taking place in the cold always consists in the formation of hypoiodite and iodide, the former of which is then more or less rapidly decomposed into iodate and iodide. A. Scott discusses the preparation of pure hydrobromic acid from bromine, and recommends the employment of sulphurous acid as a better and more convenient agent than amorphous phosphorus.

A. V. Harcourt describes several methods for determining the relative proportion of gaseous chloroform and air in a mixture of the two, and likewise a process for producing a mixture of air and chloroform in any desired proportion and of constant composition. His suggestions are likely to prove of much importance, since they will render it practicable to determine and to employ the best and safest ratio of air and chloroform vapour for producing chloroform narcosis for the purpose of surgical operations. Dealing with the preservation of pure chloroform, V. Masson states that this may be readily effected by the admixture of a very small proportion of poppy seed oil. C. G. L. Wolf has examined the phenomena of fusion of chloral hydrate, and considers that the variations observed in the melting point are not due to the existence of two modifications, but to dissociation.

In a paper on the oxidation of organic compounds by permanganate, E. Donath and H. Ditz show that, while the final products obtained with concentrated hot acid permanganate solution are usually carbon dioxide and water, oxalic acid is the chief product resulting from the oxidation with alkaline permanganate.

In his latest report on the aconite bases, W. R. Dunstan, in

conjunction with H. M. Read, deals with japaconitine, the crystalline toxic alkaloid of Japanese aconite, *Aconitum Fischeri*. This base is shown to be distinct from aconitine, which it closely resembles in its physiological action. Its composition and properties do not agree with those ascribed to it by Wright and Luff in 1879. Besides crystalline japaconitine, Japanese aconite roots are found to contain a small proportion of its first hydrolytic product, japbenzaconine. The conflicting statements hitherto published with regard to the alkaloids of jaborandi leaves have induced H. A. D. Jowett to re-investigate this subject. His results confirm the existence of a base isomeric with pilocarpine, and produced from it by the action of heat or alkali, as previously stated by Petit and Polonowsky. For this alkaloid he proposes the name isopilocarpine, in order to retain the term pilocarpidine, previously used for it, for the product originally described by Harnack and Merck under this name. The jaborine of commerce is shown to be a mixture of isopilocarpine, pilocarpidine, and traces of pilocarpine and colouring matter. No evidence has been obtained of the existence of a distinct alkaloid possessing the properties of jaborine. O. Hesse confirms Gadamer's observation that pure atropine is optically inactive, and that the optical activity of the commercial alkaloid is due to the presence of hyoscyamine. The general assumption that strychnine salts are insoluble in chloroform is stated by J. R. Hill to be true merely to a limited extent, and to strictly apply only to the sulphate when a distinct excess of sulphuric acid is present. W. Stoeder finds that the separation of strychnine and brucine in a sulphuric acid solution by means of potassium ferrocyanide is untrustworthy, but that good results may be obtained by Keller's method, in which the brucine is converted into dinitrobrucine, and the strychnine then extracted from the mixture by adding ammonia and shaking with chloroform. Researches on morphine by S. B. Schryver and F. H. Lees deal with derivatives in which the alcoholic hydroxyl group is replaced by chlorine and bromine. Additional information respecting the chemical characters of ethylmorphine hydrochloride (dionine), and of diacetoxymorphine (heroine), is furnished by L. Hesse and G. Wesenberg, while derivatives of narcotine and narceine are discussed by G. B. Frankforter and F. H. Keller. A further report on the digitalis principles is published by H. Kiliani, which chiefly deals with digitoxin, digitalin, and digitalein and their decomposition products. J. W. England expresses the opinion that digitoxin, which Kiliani considers as the most

important therapeutic principle of digitalis, cannot be regarded as fully representing the entire activity of the leaves. O. A. Oesterle describes tests for distinguishing the emodins obtained from aloe and frangula bark respectively. These two principles are evidently isomeric, but not identical. A re-investigation of the aloins leads E. Léger to the conclusion that Natal aloes contains two distinct compounds, viz., *nataloin*, $C_{16}H_{18}O_7$, and *homonataloin*, $C_{15}H_{16}O_7$, both of which can be readily distinguished from barbaloin.

The normal occurrence of arsenic in the thyroid gland, and, to a smaller extent, also in a few other organs, is pointed out by A. Gautier, who further states that those organs which are most commonly examined for arsenic in cases of suspected poisoning are normally free from that element. The same author also describes a method for the detection and estimation of traces of arsenic in organs. Experiments conducted by F. Gallard seem to prove that the human and animal skin is capable of absorbing aqueous solutions of iodides, and that the iodine thus introduced into the system is eliminated much more slowly than after its internal administration. Owing to the slow rate of this elimination, some accumulation appears to take place in the tissues of some organs, chiefly in the brain and glands.

Recent experiments by J. Abelous and E. Gérard on the action of animal ferments strongly point to the conclusion that an oxidising enzyme (oxydase) and a reducing enzyme co-exist in the tissues of animal organs. A new vegetable hydrolytic enzyme, "seminase," has been obtained by E. Bourquelot and H. Hérissey from the seeds of fenugreek and lucerne.

The complete conversion of uric acid into urea, by the action of a hot acid solution of permanganate, constitutes the basis of a process for the estimation of this acid suggested by A. Jolles. The urea thus yielded is determined by means of hypobromite in the usual way. E. Mallet effects the estimation of this acid by precipitation as copper urate, and titration of the solution of the latter in acidulated water with decinormal permanganate. Another expeditious method for the volumetric estimation of uric acid is proposed by E. Gautrelet, and consists in the titration of the urine with a solution of cuprous sulphate of definite strength, potassium ferricyanide being used as indicator. In a process for the estimation of oxalic acid in urine, devised by E. Salkowski, advantage is taken of the solubility of oxalic acid in ether, and the almost complete insolubility of phosphoric acid in this solvent. Sozoiodol (di-iodoparaphenol-sulphonic acid) is recommended by

G. Guérin as a delicate reagent for the detection of albumin in urine, while ammonium persulphate is suggested for the same purpose by C. Strzyzowski. The guaiacum reaction (blue coloration with tincture of guaiacum) is proposed by Brandenburg for the detection of pus in urine.

The presence of cystin has been detected by H. Causse in some impure well-waters, which were known to have caused typhoid fever and also proved to contain a large number of bacteria having a liquefying action on gelatin. Contrary to the opinion of Erdmann and others, L. Spiegel maintains that the presence of nitrites in water does not afford any criterion of its unsuitability for drinking purposes, unless it be considered in conjunction with other analytical data and with the nature of the soil in which the water occurs. A process for the colorimetric estimation of phosphoric acid in water, described by A. Jolles, is based on the yellow coloration produced by heating highly dilute solutions of phosphates with the molybdic reagent. In a further report on the estimation of sulphuric acid in the presence of ferric salts, F. W. Küster and A. Thiel discuss some additional means by which the barium precipitate may be obtained free from iron.

R. H. Adie and T. B. Wood recommend a method for the volumetric estimation of potassium, which consists in the precipitation of this metal as cobaltinitrite, and the titration of the nitrite with potassium permanganate in an acidified solution. The volumetric estimation of zinc is effected by M. Pouget by decomposing the precipitated sulphide with an excess of iodine solution, and titrating the excess of the latter with sodium thiosulphate. An expeditious colorimetric process for the approximate determination of nickel, described by M. Lucas, depends on the red coloration produced in neutral or alkaline solutions of this metal by an excess of potassium or ammonium thiocarbonate. Bettendorf's test for arsenic is discussed by several investigators, who deal with the conditions most favourable for the success of this reaction.

A. Heynemann has critically compared the chief methods for the estimation of tannic acid, and finds that the best results are obtained by the gravimetric hide powder process, provided that this is conducted under definite and strictly comparable conditions. In a note on glacial acetic acid, F. H. Alcock points out that, in a reversed form, the requirement that oil of turpentine should be soluble in an equal volume of glacial acetic acid, would constitute a useful addition to the official characters and tests for this

acid. In conjunction with T. H. Thomas, the same author calls attention to the sources of error to which the B.P. test for chloral hydrate is liable unless it be conducted with certain precautions and slight modifications. The official requirements with regard to aromatic spirit of ammonia are criticised by E. White. M. Duyk finds that a saturated solution of sodium salicylate is a useful solvent for separating many of the constituents of essential oils, and may be employed for their determination in the chemical examination of the oils, as well as for their extraction on a large scale. A reaction with benzaldehyde and sulphuric acid, described by Melzer as characteristic for picrotoxin, is found by H. Kreis to be shared also by cholesterol and phytosterol, and to be liable, therefore, to lead to erroneous conclusions in toxicological researches. New colour reactions of morphine and of nicotine are described by R. Kobert and I. Schindelmeiser respectively. The titration of alkaloids by means of standard acids is rendered easier by a modified process recommended by E. Falières, in which an ammoniacal copper solution is used as indicator. With this, the exact point of neutralisation is indicated, not by a mere colour change, but by the formation of a precipitate of copper oxide, which is much more readily discerned in such cases.

The accuracy of Soxhlet's method for the estimation of fat in milk, in which the amount of fat is deduced from the difference in the specific gravity of water-saturated ether before and after agitation with slightly alkalized milk, is confirmed by M. Kühn. A simplified process for the estimation of salicylic acid in milk is described by G. Breustedt. Feeding experiments on kittens with milk containing additions of boric acid and of formaldehyde are described by H. E. Annett, who claims to have obtained unmistakable indications of the injurious effects of these preserving agents. Confirmatory evidence of the toxic action of boric acid is furnished by J. J. Evans, who has repeatedly observed the appearance of an erythematous rash, followed by a fine scaly exfoliation and loss of hair, as an outcome of the prolonged internal administration of this acid. On the other hand, it is asserted by O. Liebreich that boric acid as well as borates must be regarded as non-toxic, and that they can be taken in moderate quantities for a long time without producing any injurious effects. The sweetening of beverages and articles of food with saccharin is considered by L. Nencki as harmless, since the small quantities of this substance usually employed do not appreciably interfere with the digestive processes.

Chemical research has again been extended to a large number of vegetable drugs, some of which may be briefly referred to in this place. The leaves of *Psathura angustifolia*, which have a local reputation in the island of Réunion as an aromatic, digestive stimulant and diaphoretic, have been examined by E. Heckel and F. Schlagdenhauffen, who have not been able to verify Kobert's statement as to the presence of an alkaloid resembling or identical with caffeine. Their results indicate the entire absence of alkaloids or glucosides in this drug. The emetic and purgative effects of ivy (*Hedera helix*) are traced by A. Joanin to the glucoside *hederin*, isolated from the plant by Houdas. The nervous symptoms caused by ivy seem to be due to some other principle. The leaves of *Helleborus fetidus* are found by P. Vadam to contain a powerful oxydase. From *Bocconia cordata*, a Japanese plant belonging to the *Papaveraceæ*, P. Murrill and J. O. Schlotterbeck have isolated three distinct alkaloids, which proved to be protopine, β-homochelidonine and chelerythrine. A bitter glucosidal principle has been detected by J. S. Gurie in the leaves of the annatto plant, *Bixa orellana*, which are stated to possess anti-emetic properties. A new liquid alkaloid of the composition $C_9H_{17}ON$ has been discovered by A. Piccinini in the root bark of the pomegranate. In addition to the already recorded constituents of cascara sagrada, Leprince has obtained chrysarobin, chrysophanic acid and emodin from this drug. It is evident that these play an important part in the therapeutic action of the bark. The examination of a sample of black willow bark has revealed to H. A. D. Jowett the presence of a new glucoside, differing essentially from salicin in forming a colourless instead of a blood-red solution with sulphuric acid. Reporting on the lily of the valley, *Convallaria majalis*, M. Moguliss points out that the fresh flowers should be used for the preparation of a fluid extract, instead of the root as recommended in the U.S.P., since the root contains comparatively little glucoside. From the results of numerous determinations of the percentage of resin in jalap root, carried out by L. F. Kebler during the last six years, it would seem that there has been a constant decrease in the quality of this drug met with in the American markets. An analysis of the root of *Aralia nudicaulis* by W. C. Alpers shows this drug to contain both a fixed and a volatile oil. In a paper on Malabar kino, the produce of *Pterocarpus marsupium*, D. Hooper calls attention to the very large proportion of tannin contained in authentic specimens of this drug. This tannin (kino-tannic acid) is found by him

to amount to 70–82 per cent., which is considerably more than has generally been supposed. A report on *Butea kino* is published by the same author, in which it is shown that, compared with the official drug, this kino is very impure and only very partially soluble, besides having the disadvantage of being specially liable to rapid alteration from the soluble to the insoluble condition. According to M. Picquet, the extract of the bark of *Brugiera gymnorrhiza*, a variety of mangrove which can be readily cultivated in Europe, has a composition rendering it well suited to take the place of catechu. A re-investigation of the seeds of *Delphinium staphisagria* by F. B. Ahrens has furnished evidence of the presence of a new alkaloid, *staphisagroine*, in addition to the four bases previously known to exist in this drug. The seeds of *Datura fastuosa* are found by W. P. H. van Driessen Mareeuw to contain hyoscyamine in the proportion of 0·149 per cent. The poisonous properties of vanilla, or at least its irritant effects on the skin, are attributed by M. Audeoud to the presence of cardol in the pods. S. Pouchet records the interesting observation that the poisonous action of the juice of the fly agaric is considerably greater than that of the corresponding proportion of muscarine contained in it, and that this increased toxicity is due to the presence of albuminoids, which, though much less poisonous than the alkaloid muscarine, seem to increase the activity of the latter by their action on the intestinal mucous membrane. In consequence of this observation, the question is being investigated as to whether the toxicity of the poisonous alkaloids of certain arrow poisons is not similarly increased by the presence of less toxic albuminoids possessing the power of promoting the absorption of the alkaloids. From Wakamba arrow poison, L. Brieger has isolated a highly toxic glucoside of the composition $C_{29}H_{46}O_{19}$, which somewhat resembles Arnaud's ouabain.

K. Schumann discusses the two chief varieties of kola nut met with in commerce, and shows that while the smaller kind having four cotyledons is the produce of *Cola acuminata*, the larger kind with two cotyledons must be referred to a new species, which he proposes to name *C. vera*. Reporting on chaulmoogra seed, E. M. Holmes refers to the confusion concerning the seeds sold under this name, and supplies a description of the genuine drug, which is the produce of *Gynocardia odorata*, and the seeds of *Hydnocarpus anthelmintica* and *H. wightiana*, both of which are also met with in commerce as chaulmoogra seeds.

In a report on spurious Alexandrian senna, H. G. Greenish deals

chiefly with the leaflets of *Cassia obovata*, showing how these may be distinguished from the official drug, and how their presence in powdered senna may be recognised by their structural characters. J. Barclay describes a sample of Bolivian coca adulterated with small jaborandi leaves from *Pilocarpus microphyllus* and *P. spicatus*. Admixtures of the rhizome of *Aristolochia serpentaria* and the roots of *Stylophorum diphyllum* and *Cypripedium parviflorum* have been observed in adulterated hydrastis by E. Collin. Attention is directed to the practice of imparting to the exterior of inferior kinds of vanilla a crystalline coating similar to the incrustation of vanillin formed on the best qualities of the drug, by condensing the vapour of benzoic acid on the surface of the pods. A sample of adulterated scammony is reported upon by F. Baucher, in which the adulterant consisted of a mixture of starch and galena. The present scarcity in the market of asafetida of satisfactory quality is commented upon by C. G. Moore, J. C. Umney, and E. M. Holmes, all of whom show that the drug as now met with in commerce is very largely adulterated with earthy matters in the districts in which it is collected.

Some of the numerous drugs and preparations which have been investigated during the past year with regard to their physiological or therapeutic properties, call for a brief notice in this chapter. The toxic action of male fern, which has been repeatedly observed in cases in which more than the usual small doses of the extract have been administered, is found by M. Walko to be attributable rather to the aspidin and aspidinin occurring in the drug than to filicic acid. The anthelmintic value of male fern is found by R. Boehm to depend on the presence of aspidin as well as of filicic acid. The former of these principles is stated by A. Hausmann to occur in *Aspidium spinulosum*, but not in *A. filix mas*, and this observation leads him to the conclusion that an ethereal extract containing this principle may be regarded as having been made partly from the roots of the *A. spinulosum*, which an inexpert collector may mistake for the official species. A remedy for cancer, suggested by M. Bra, consists of cultures of *Nectria ditissima*, the fungus which produces "vegetable cancer" in trees. His suggestion is based on the observation that inoculations of trees with cultures of the human cancer parasite resulted in a "cancer" in all respects resembling that produced by *Nectria*; while the treatment of rabbits with cultures of *Nectria* caused the gradual production of round ulcers in the stomach similar to those produced by the ingestion of cultures of the human parasite. The

emetic and purgative properties of melon root are referred to by Heberger, who has isolated from it a bitter extractive producing a marked emetic action in doses of 7½ to 10 grains. The bulbs of *Allium sativum* have been employed by G. Cavazzani with considerable success in the treatment of pulmonary tuberculosis. Ipecacuanha, administered in the form of a weak aqueous solution of an extract by rectal injection, is strongly recommended by R. Blondel for chronic constipation. The leaves of *Symplocarpus fœtidus* are stated by MM. Cæsar and Loretz to possess antispasmodic properties, and to be useful for the relief of attacks of asthma. MM. Hendrickx and Coremans speak highly of the value of *Theobroma kalagua*, as a substitute for kola, with which it shares the power of stimulating the nutritive processes. They also state that it possesses well-marked microbicidal properties. *Parnassia palustris* is claimed by W. Peters to be a useful remedy for the treatment of epilepsy. A very favourable account is given by A. N. Wilkinson respecting the value of cinnamon in the treatment of tropical diarrhœa. Alcornoco bark, the produce of a South American species of *Browdichia*, is recommended by C. Hartwich as an efficient substitute for jaborandi. The merits of kosam seeds, the product of *Brucea sumatrana*, as a remedy for dysentery, which seem to have been known to the Abyssinians long ago, are now confirmed by Dybowski. Marked tænicidal properties are attributed to camphor by M. Besser, and to salol by M. Galli-Valeris.

The use of salol is strongly advocated by C. Begg in the treatment of small-pox, in which he has found it to check the irritation and to prevent suppuration. The value of this treatment is corroborated by J. Biernacki and P. N. Jones. W. Ashurst calls attention to the power of benzoic acid, when administered internally, of preventing or greatly retarding alkaline fermentation in the urine. He thus explains the value of this acid as a remedy in cystitis and other catarrhal conditions of the urinary tract. Several investigators report on the great value of glycerin in renal concretions of uric acid, which seems to be still further enhanced by its combining anodyne properties with its power of expelling the concretions. A glycerin extract of suprarenal glands has been used by C. Hell with success in the treatment of epilepsy. Chloral hydrate, in doses of 1½ to 3 grains, has been found useful by O. Rosenbach in the treatment of nervous dyspepsia. F. A. Rouget confirms the high value of magnesium sulphate in cases of acute tropical dysentery. The special suitability of sodium cacodylate for arsenic

medication, particularly for administering arsenic in the form of hypodermic and rectal injections to phthisical patients, is discussed by J. Rénaut. Sodium metavanadate, in very small doses, is recommended as a powerful stimulant to the organs of nutrition, and is stated to be superior to arsenic in its tonic properties.

Alcohol is stated by A. M. Phelps, and likewise by several other observers, to be valuable as an external application for counteracting the caustic effects of carbolic acid on the skin; and the same remedy is reported by J. A. Kelly to have proved an efficient internal antidote to this poison. The efficacy of potassium permanganate as an antidote to strychnine is confirmed by M. Paratore. It is shown to be necessary, however, to apply this antidote before or immediately after the onset of the tetanic symptoms. Solution of ammonium acetate is found by G. André to possess the power of counteracting the toxic action of formaldehyde, and is therefore suggested by him as an antidote to the latter. A fairly long internal treatment with chloroform water, previous to an operation, is found by Weber to have the effect of ensuring immunity from the nausea, vomiting and other undesirable symptoms which so frequently follow chloroform narcosis.

E. Schmidt deals with the assay of belladonna, stramonium and hyoscyamus, and suggests for this purpose a modification of Keller's method, in which iodoeosin is used as an indicator. Another process for the assay of hyoscyamus is described by W. A. Puckner. H. M. Gordin and A. B. Prescott propose the application of their iodometric method of estimating alkaloids to the determination of hydrastine and berberine in the assay of the rhizome of *Hydrastis canadensis*. The assay of colchicum is carried out by the same authors by saponification of an alcoholic extract with standard alkali and subsequent titration with standard acid, phenolphthalein being used as indicator. The official processes for the assay of ipecacuanha, belladonna and nux vomica, and of their preparations, are very fully and ably discussed in a series of reports by F. C. J. Bird. F. H. Alcock publishes a method for the assay of liquid extract of ipecacuanha, which he finds more expeditious and accurate and less troublesome than the official process. Attention is directed by R. G. Guyer, and also by J. C. Umney, to the deterioration which takes place in the alkaloidal value of liquid extract of ipecacuanha, and to a greater extent in ipecacuanha wine; but it remains still to be determined whether this deterioration is due to chemical decomposition, or to a mere deposition of alkaloid compounds. Processes for the assay of cinnamon water

and of oil and spirit of mustard are suggested by M. Duyk and J. Gadamer respectively. E. R. Squibb has continued his experiments respecting the use of acetic acid in the place of alcohol for extracting the active principles of some officinal drugs, and now reports on the suitability of this menstruum for the extraction of belladonna root. He also recommends this acid for the preparation of fluid extract of cinchona, and likewise for the extraction of the alkaloids in the assay of cinchona bark. Experiments with thoroughly purified methyl alcohol as a menstruum for the exhaustion of drugs in the preparation of a number of tinctures and alcoholic extracts have been carried out by W. L. Scoville, who arrives at the conclusion that equally good products can be obtained with this menstruum as with ethyl alcohol. The preparation of tincture of myrrh by maceration only, as directed in the present Pharmacopœia, is regarded by G. F. Merson as a retrograde step, as the product it yields is not quite equal to that obtained by percolation, and the process requires considerably more time. For the preparation of tincture of digitalis, the previous removal of fat from the leaves by means of purified petroleum spirit is advocated by J. W. England, who claims that the product thus obtained is more readily absorbed and prompter in its action than the ordinary tincture. An improved formula for the preparation of syrup of rhubarb is suggested by F. W. Haussmann.

A full report of the papers read and discussed at the recent meeting of the British Pharmaceutical Conference in London will be found in the "Transactions," which constitute the concluding part of this volume.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Polonium, a New Radio-active Element contained in Pitchblende. P. and S. Curie. (*Comptes Rendus*, cxxvii. 175–178.) The authors have chemically examined a specimen of pitchblende possessing greater radio-activity than uranium. The acid solution of the mineral was treated with sulphuretted hydrogen, which leaves uranium and thorium in solution. The active substance was found to be precipitated with the sulphides insoluble in ammonium sulphide, and after separating these in the usual way, it remained with the bismuth. On heating the sulphides of bismuth and the active substance in a vacuum at a high temperature, a sublimate was obtained possessing 400 times the activity of uranium. The very great activity of this substance obtained from pitchblende is attributed to an unknown metal to which the name *polonium* is given. But as yet no spectra lines characteristic of the new element have been obtained.

Radium, a New Radio-active Element. P. and S. Curie and G. Bémont. (*Comptes Rendus*, cxxvii. 1215–1217; *Journ. Chem. Soc.*, 1900, ii. 82.) In the course of their researches on radio-active substances, the authors have obtained a product having all the properties of barium chloride, and, in fact, consisting mainly of this compound, but differing from the ordinary chloride in being extremely active. By repeated fractional precipitation of the active chloride from its aqueous solution by alcohol, a product is obtained which is 900 times more active than uranium. Ordinary barium salts are never radio-active, and, moreover, spectroscopic examination of the active substance has revealed the presence of a

well-defined line not belonging to any known element; the distinctness of the line increases with the radio-activity of the fraction under inspection. For these reasons, it is supposed that the active barium chloride contains another radio-active element for which the name *radium* is proposed. The atomic weight of barium in the active salt is not markedly different from that of the element in its inactive compounds.

The compounds of uranium, thorium, polonium, and radium all give photographic effects on sensitive plates, and in this respect polonium and radium are far more active than the other two; the rays emitted by the new elements render barium platinocyanide fluorescent, but the effect is less marked than with Röntgen rays.

The spectrum of radium is described by E. Demarçay (*Comptes Rendus*, cxxix. 716, 717).

Actinium, a New Radio-active Element. A. Debierne. (*Comptes Rendus*, cxxx. 906–908; *Journ. Chem. Soc.*, 1900, ii. 350, 351.) The constituents of pitchblende which are not precipitated by sulphuretted hydrogen from an acid solution, but are precipitated by ammonia or ammonium sulphide, include a small quantity of a substance which emits radiations capable of acting on a photographic plate, making barium platinocyanide phosphorescent and accelerating the discharge of electrified bodies. Its radio-activity seems to be about 100,000 times as great as that of uranium. It differs from radium in not being luminescent.

This new element, to which the name actinium is given, belongs to the iron group, and may be obtained in a more concentrated form by submitting the substances containing it to the following operations:—(1) Addition of excess of sodium thiosulphate to solutions slightly acidified with hydrochloric acid; (2) action of hydrofluoric acid and potassium fluoride on the freshly precipitated hydrates suspended in water; (3) oxidation of neutral solutions of the nitrates by hydrogen peroxide; (4) precipitation of insoluble sulphates. In every case the precipitate or residue is strongly radio-active, and contains nearly the whole of the actinium; the second process serves to separate this substance from titanium. The element itself has not been actually isolated from these mixtures, but by a methodical application of the processes referred to, the greater portion of it may be extracted. The predominating constituent in the most active fractions was found to be thorium. Unlike radium or polonium, the new element is not affected by the precipitants for barium or bismuth.

Actinium seems to resemble thorium in its chemical properties, and the slight radio-activity exhibited by compounds of the latter may possibly be due to the presence of the former substance.

Victorium, a New Element associated with Yttrium. Sir W. Crookes. (*Proc. Royal Soc.*, lxv. 237–243.) The method of separating victoria from earths of the cerium group and from yttria is described in detail. Long-continued fractionations (*a*) by fusion and partial decomposition of the nitrates, (*b*) by crystallisation of the oxalates, and (*c*) by precipitation with potassium sulphate, were had recourse to in succession, and the course of the fractionation is shown by a diagram.

Victoria is an earth of a pale brown colour, easily soluble in acids, and less basic than yttria. Assuming the oxide to have the formula Vc_2O_3, the atomic weight is about 117. The best material for phosphorescing in a vacuous tube is, not the earth itself, but the anhydrous sulphate; the photographed phosphorescent spectrum contains a pair of strong lines at about λ3120 and 3117, and other fainter lines at 3219, 3064, 3060.

Solidification of Hydrogen. J. Dewar. (*Chemical News*, lxxx. 132.) The author has succeeded in effecting the solidification of hydrogen, and gives a description and woodcut illustration of the apparatus by means of which this result has been accomplished. The solid hydrogen was obtained in the form of a transparent ice-like body, devoid of all metallic appearance, and showing a great tendency to form a white foam-like mass. This tendency prevented the density of the solid from being determined, but the maximum fluid density has been approximately ascertained. This was found to be 0·086, the liquid at its boiling point having the density 0·07. The solid hydrogen melts when the pressure of the saturated vapour reaches about 55 mm. Observations with regard to temperature are as yet incomplete, and will be dealt with in a further report. For particulars as to the apparatus and the *modus operandi* employed to effect the solidification, reference should be made to the original paper.

Iodine in Sea Water. A. Gautier. (*Comptes Rendus*, cxxviii. 1069–1075, and cxxix. 9–15.) The results of the author's investigations show that while the total iodine in sea water, and also the iodine existing in it in the form of soluble organic compounds, are practically constant in all depths, the iodine existing in the form of metallic iodides and iodates decreases as the surface is approached, and ultimately disappears altogether. The variation of the iodine present in an insoluble form and forming part of the substance of

organised bodies is in the converse direction, the smallest amount being detected at the greatest depth, at which but few living organisms are found. Water taken from the surface of the sea contains no metallic iodides, and the whole of the iodine exists in that stratum in the form of organic combination, four-fifths of which is contained in soluble compounds while the remainder is insoluble and forms part of the substance of the infusoria inhabiting the superficial layers of the ocean. The total amount of iodine in the Mediterranean Sea was found to amount to 2·24–2·38 parts per million.

Iodine in the Atmosphere. A. Gautier. (*Bull. Soc. Chim.*, 1899, 456–463.) The air at Paris and at the sea coast was found to contain respectively 0·0013 milligramme and 0·0167 milligramme of iodine in 1,000 litres, of which none could be found in the same air previously freed entirely from dust. Hence all the iodine is contained in the dust, and is probably present in small vegetable organisms suspended in the air. No soluble iodides could be detected in the atmospheric dust.

Atomic Weight of Boron. H. Gautier. (*Chemical News*, lxxx. 230.) The author's experiments were carried out with boron sulphide and boron carbide, both prepared from pure amorphous boron obtained by Moissan's process. The mean result of four determinations gives the atomic weight as 11·041, with a probable error of 0·017.

Production of Ozone by the Action of Fluorine on Water. H. Moissan. (*Comptes Rendus*, cxxix. 570–573.) The oxygen liberated on passing fluorine into water at 0° C. contains from 10–14 per cent. of ozone. At this temperature the yield of ozone is greatest when a rapid current of the gas is kept up; with a slower current it becomes less, and falls considerably if the temperature of the water increases.

Action of Magnesium on Water. E. G. Bryant. (*Chem. News*, lxxx. 211, 212.) Commercial magnesium, containing 1·77 per cent. of iron and 0·3 of calcium, was found to evolve hydrogen when placed in water, the action continuing for many hours with decreasing energy, and finally ceasing. 0·1 gramme of the powdered metal, placed in 100 c.c. of water, yielded 2–3 c.c. of hydrogen; this quantity could be increased by the addition of normal sodium sulphate, which dissolves magnesium oxide. Application of heat to the water did not increase the yield of hydrogen, but accelerated its evolution. The author regards the process as a direct action

of magnesium on water, and not as being brought about indirectly by the formation of a couple.

Purification of Water. A. Tixier. (*Journ. de Pharm.* [6], x. 297–300.) In order to avoid the liberation of free alkali which occurs when potassium permanganate or calcium permanganate is used for the purification of water, the author uses a solution containing aluminium permanganate and barium permanganate. The solution employed has a density of 35° B., and contains 290 grammes of permanganic acid per litre, and 7 per cent. of alumina. It is added to the water to be purified until a persistent pink coloration is produced; the water is allowed to remain for 24 hours, and after filtration through a carbon or other filter is fit for consumption.

Significance of the Detection of Nitrites in Drinking Water. L. Spiegel. (*Ber. der deutsch. chem. Ges.*, xxxiii. 639–644.) The author disagrees with Erdmann's statement that nitrites never occur in a good drinking water. In his opinion the presence of nitrites in water is no criterion of its value for drinking purposes, as this can only be deduced from a complete examination of the water, coupled with a knowledge of the nature of the soil in which it occurs.

The author's conclusion, that the presence of nitrites in water is in itself of little value for hygienic diagnosis, is endorsed by E. Schaer (*Ber. der deutsch. chem. Ges.*, xxxiii. 1232–1236).

Preparation of Pure Hydrobromic Acid. A. Scott. (*Proc. Chem. Soc.*, xvi. No. 221.) The author recommends the employment of sulphurous acid as a better and more convenient agent for preparing hydrobromic acid from bromine than amorphous phosphorus, even when purified from chlorides as Stas recommends. Almost all samples of phosphorus contain arsenic to a certain extent, and this, by the action of the bromine, becomes arsenious bromide which distils over with the hydrobromic acid, giving rise to arsenites and arsenates in the bromides prepared from acid made in this way.

By distillation two or three times, the hydrobromic acid is easily separated from the sulphuric acid formed at the same time, but it is always safer to add a little barium bromide before the final distillation. The purity of the acid was all that could be desired; this was shown by preparing from it some pure potassium bromide and titrating it against pure silver with all Stas's precautions, when its equivalent was found to be 119·099 (Ag = 107·93). Similar determinations with potassium bromide

from hydrobromic acid prepared as recommended by Stas and by J. P. Cooke gave 119·099 and 119·102 respectively. Stas's own number (mean of 14 experiments) is 119·095.

Nitrogen Iodide. C. Hugot. (*Comptes Rendus*, cxxx. 505. From *Pharm. Journ.*) The different formulæ given by various experimenters for the detonating substance obtained by the action of ammonia on iodine has induced the author to investigate the matter. He finds that when iodine, contained in a tube surrounded by a freezing mixture, is treated with gaseous ammonia under pressure, the black liquid at first formed becomes decolorised, and deposits a crop of dark green crystals. This body appears to be fairly stable below 10° C., but above that temperature it readily undergoes decomposition. Direct decomposition is only effected by violent explosion. The constitution of the body was therefore determined by allowing it to decompose slowly and spontaneously. In this way results were obtained which established the formula, $NI_3\,3NH_3$ for these crystals. The mother liquor, from which they were separated, was found to consist of the triammonio-ammonium iodide $NH_4I\cdot 3NH_3$ formerly described by Troost. The reaction may be expressed by the equation, $16NH_3 + 6I = 3(NH_4I\cdot 3NH_3) + NH_3\,3NH_3$. The green crystals, maintained *in vacuo* at a temperature of 30° C., lose a molecule of ammonia, and leave a yellowish white crystalline residue, $NI_3\,2NH_3$. That, when exposed to 0° C. *in vacuo*, parts with another molecule of ammonia, the fine violet crystals left having the formula NI_3NH_3. This last body decomposes *in vacuo* without explosion when slowly warmed to 30° C. If heated above that temperature a violent detonation results. The author was unable to remove the last molecule of ammonia.

A New Iodide of Nitrogen. A. Hantzsch. (*Ber. der deutsch. chem. Ges.*, xxxiii. 522–527.) On adding an ethereal solution of iodine to silver azoimide suspended in water at 0°, extracting with ether, and allowing the latter to evaporate below 0°, a nearly colourless solid is obtained, which, from a determination of the ratio of nitrogen to iodine in a freshly prepared aqueous solution, appears to have the composition N_3I; the dry substance often decomposes spontaneously with great violence, giving rise to nitrogen and iodine, whilst the same products are formed when slow decomposition occurs in benzene or chloroform solution. An aqueous solution of the iodide is at first neutral to litmus, and produces no coloration with starch solution, but decomposition occurs somewhat rapidly to azoimide and hypoiodous acid, which is

then further resolved into iodine and iodic acid. Aqueous silver nitrate gives rise, similarly, to silver azoimide, iodine, and iodic acid, a reaction which furnishes the means of determining the ratio of iodine to nitrogen present in the compound.

Phosphorus Suboxide. A. Michaelis and M. Pitsch. (*Liebig's Annalen*, cccx. 45–74.) Phosphorus suboxide, P_4O, first obtained by L. Verrier, is precipitated on adding an acid to a solution of phosphorus in alcoholic potash diluted with water (see *Year-Book of Pharmacy*, 1899, 21); it is also formed on withdrawing the elements of water from hypophosphorus acid by the action of acetic anhydride. It is an orange-red powder of sp. gr. 1·9123 at 26°, but the colour depends largely upon the state of division, being sometimes pale yellow. When thoroughly dried, it is almost odourless, but a trace of moisture imparts to it the odour of phosphine; in the former condition, also, it may be heated in air to a comparatively high temperature without becoming ignited, but when moist it burns readily after being heated at 90° during several hours. If dried and heated in an indifferent gas, phosphorus distils over, leaving phosphoric oxide. Chlorine converts the dried oxide into phosphorus oxychloride and phosphorus pentachloride, the damp substance being oxidised to phosphoric acid, which is also produced by the action of sodium hypochlorite and of warmed sulphuric acid, the latter becoming reduced to hydrogen sulphide. Concentrated nitric acid ignites the substance, which is indifferent towards hydrochloric acid. Many metals are precipitated by it from solutions of their salts either in metallic form, or as phosphorus compounds. A solution of sodium or potassium hydrate in aqueous alcohol dissolves phosphorus suboxide, forming a deep red solution; when warmed, or on standing at the ordinary temperature, this solution evolves hydrogen and phosphine, sodium hypophosphite remaining dissolved. The oxide is coloured brown by ammonia, but the latter is removed on exposure to air, and the substance regains its orange-red hue.

Hydrates of Sulphuric Acid. E. von Biron. (*Journ. Russ. Chem. Soc.*, xxxi. 517–522.) The author has succeeded in crystallising the hydrate $H_2SO_4, 2H_2O$, predicted by Mendeléeff. A solution of the composition $H_2SO_4, 2H_2O$, cooled with liquid air, solidifies to an amorphous mass. This mass, if rubbed at rather a higher temperature with a glass rod, becomes crystalline, the thermometer rising at the same time to –35°. The crystals thus obtained may be used to start crystallisation in a solution of the

composition $H_2SO_4, 2H_2O$ cooled merely to -75° with solid carbon dioxide and ether. Cooling with liquid air is detrimental to the formation of the crystals.

The freezing point of the hydrate was determined in a Beckmann's apparatus of small size, well protected by surrounding tubes, and cooled in a mixture of carbon dioxide and ether. During solidification, the thermometer remained steady for about 10 minutes, until practically no liquid was left, showing that the separation of the solid did not alter the freezing point of the remaining liquid. In solutions which deviated from the composition $H_2SO_4, 2H_2O$, the thermometer was steady for only 1—2 minutes. The freezing point of the hydrate is -38·9°; with the same apparatus, the hydrate $H_2SO_4, 4H_2O$ solidified at -69°.

Preparation of Pure Alkaline Nitrites. E. Divers. (*Chemical News*, lxxxi. 19.) Nitric acid is made to react on starch, or on arsenious acid; the temperature and the strength of the acid are regulated in such a manner that in the products obtained nitric oxide should be in excess over the peroxide. The gas is passed into an empty flask, where the nitric acid is deposited, then into a concentrated solution of pure alkaline hydrate or carbonate, and the resulting solution is evaporated to dryness.

The nitrites of potassium and sodium are slightly yellow, very soluble in water, and alkaline to litmus. When free from nitrates their solutions may be evaporated to dryness without decomposition. The two salts when crystallised are anhydrous, but they soon deliquesce. Sodium nitrite melts at 271°.

Percarbonates. S. M. Tanatar. (*Ber. der deutsch. chem. Ges.*, xxxii. 1544–1546.) The author describes several sodium percarbonates, but considers it still open to question whether these compounds are in reality salts of percarbonic acid, H_2CO_4, or whether they are merely double compounds of the carbonate and hydrogen peroxide in which the latter plays the part of water of crystallisation. For particulars, reference should be made to the original paper.

Direct Conversion of Ammonia in Solution into Nitrates. E. Demoussy. (*Comptes Rendus*, cxxviii. 566–599. From *Journ. Chem. Soc.*) When a solution containing ammonium sulphate, calcium carbonate, and potassium phosphate is inoculated with soil containing the nitrous and nitric ferments, the ammonia is converted into nitrate, but the intermediate formation of nitrite is readily detected. If, however, the nitric ferment is first cultivated in a solution of potassium nitrite, calcium carbonate, and

potassium phosphate, and then an ammonium salt is added to the liquid, the ammonia is completely and somewhat rapidly converted into nitrate, but the intermediate formation of nitrite cannot be recognised at any stage. It would seem, therefore, that the impossibility of detecting nitrites in soils in which nitrification is going on is due to the fact that the rates of production of nitrite and of its conversion into nitrate are equal. This conversion is made possible by the slow rate of production of ammonia from the organic matter in the soil and the consequent slow production of nitrite, whilst, on the other hand, the quantity of nitric ferment present is large. In liquids containing ammonia salts, the production of nitrites is rapid and the number of nitric organisms present is proportionately much smaller than in soils.

Preparation of Pure Sodium Metavanadate. M. Pécourt. (*Répertoire* [3], xi. 487.) This salt may be prepared for therapeutic purposes as follows:—Pure vanadic acid, obtained from ammonium vanadate, is dissolved in an excess of sodium hydrate, the boiling solution neutralised with acetic acid, then concentrated by evaporation and precipitated by strong alcohol. The yellow precipitate is re-dissolved in boiling water, then again precipitated by alcohol, and this process repeated, if necessary, until the product is free from sodium acetate. These operations must be conducted expeditiously, as prolonged boiling with alcohol would involve a notable reduction of the vanadate.

Potassium Arsenate. J. Lothian. (*Pharm. Journ.*, 4th series, x. 183.) Of the three potassium salts of orthoarsenic acid, K_3AsO_4, K_2HAsO_4, KH_2AsO_4, the latter, or mono-potassium arsenate, is the only stable one. It is most readily prepared by fusing at a low red heat in a porcelain crucible a mixture of equal parts of dry potassium nitrate and arsenious anhydride, when cold dissolving the fused mass in water, evaporating and setting aside to crystallise. The reaction may be represented by the following equations, potassium metarsenate being formed, which, on solution, is converted into mono-potassium arsenate.

$$4KNO_3 + As_4O_6 = 4KAsO_3 + 2N_2O_3.$$
$$KAsO_3 + H_2O = KH_2AsO_4.$$

The salt crystallises out in dimetric octohedra. The crystals are anhydrous and permanent in air, have an acid reaction, are soluble in about 5 parts of water, and almost insoluble in 90 per cent. alcohol. They contain 63·8 per cent. As_2O_5. The author finds

the solubility of the salt in water to be 20·72 grammes in 100 grammes of solution at 15° C.

When arsenic acid is neutralised by potassium bicarbonate (which is a purer compound than the commercial carbonate or hydrate) the salt K_2HAsO_4 exists in solution. On evaporation, however, crystals of KH_2AsO_4 are deposited, and as the crystallisation proceeds the mother liquor becomes very alkaline. If the mother liquor is now neutralised with more arsenic acid, a fresh crop of crystals of KH_2AsO_4 is obtained, and the mother liquor again becomes alkaline. This is explained by the hydrolysis of the K_2HAsO_4 in solution.

$$K_2HAsO_4 + H_2O = KH_2AsO_4 + KOH.$$

On evaporation the equilibrium is upset by the greater stability of the dissociated molecule KH_2AsO_4 (the salt K_2HAsO_4 does not crystallise), which, although an acid salt, crystallises out in the presence of the alkali. Similarly, when arsenic acid is neutralised by sodium bicarbonate, the salt Na_2HAsO_4 is formed, and may also be assumed to exist in solution hydrolysed. $Na_2HAsO_4 + H_2O = NaH_2AsO_4 + NaOH$. On evaporation, however, the salt Na_2HAsO_4, $7H_2O$, or $12H_2O$, continues to crystallise out, a reassociation of the dissociated molecules taking place, owing to the greater stability of the salt Na_2HAsO_4.

Referring to a recent observation that strychnine was deposited from a mixture containing liq. sodii arsen. and liq. strychninæ hydrochlor., the author considers that this deposition is explained by the hydrolysis of the sodium arsenate. In this case the equilibrium is upset in the opposite direction, the dissociated NaOH being neutralised by the hydrochloric acid of the strychnine hydrochloride, strychnine deposited, and the salt NaH_2AsO_4 left in solution.

On the strength of Lothian's observations, J. R. Hill (*Ibid.*, p. 184) advocates the official recognition of mono-potassium arsenate in the place of liquor sodii arsenatis, and suggests for it the following characters and tests:—In colourless dimetric octohedral crystals, anhydrous, permanent in air, soluble in 5 parts of water, and yielding an acid solution; almost insoluble in alcohol (90 per cent.). A solution of 1 gramme of potassium arsenate, with 1 of glacial acetic acid, in 50 c.c. of water, should require 2·10 grammes of lead acetate for complete precipitation. The powdered crystals should not lose more weight than about 1 per cent. when heated to 300° F. (148·9° C.) (limit of interstitial

moisture). The other characters are similar to those applying to sodium arsenate.

The Hydrosulphides, Sulphides, and Polysulphides of Potassium and Sodium. W. P. Bloxam. (*Proc. Chem. Soc.*, xv. No. 211.) In this paper the author shows that there is a very important difference between treating the aqueous solution of a sulphide and one of a hydrosulphide with sulphur. When sulphur is added to aqueous solutions of potassium and sodium sulphides, some thiosulphate is always formed along with the polysulphide, whilst hydrogen sulphide is evolved. This points to the sulphide having become, in part at least, hydrolysed into hydrate and hydrosulphide. The action of sulphur on aqueous solutions of the pure hydrosulphides gives pure polysulphides with evolution of hydrogen sulphide.

The various wet and dry methods of preparing the sulphides and polysulphides of potassium and sodium described by the many authors who have worked at this subject have been repeated by the author, who concludes that: (1) none of these authors could have obtained any polysulphide pure, but only a mixture of polysulphide and thiosulphate; (2) no method exists for separating the polysulphide from the thiosulphate.

The author has succeeded in obtaining the following hydrates of potassium sulphide: $K_2S, 2H_2O$; $K_2S, 5H_2O$; $K_2S, 12H_2O$. These salts can be dehydrated in a current of dry hydrogen, and the potassium sulphide remains stable at 560°. As $K_2S, 5H_2O$ loses $5H_2O$, it is evidently not $KHS, KHO, 4H_2O$. Sodium sulphide was obtained as $Na_2S, 9H_2O$.

By saturation of a solution of potassium hydrate with hydrogen sulphide, crystals of the composition $2KHS, H_2O$ were obtained, which, like the hydrates of the normal sulphide, could be dehydrated without loss of sulphur. The hydrosulphide was quite stable at 560°.

According to Sabatier, the hydrated crystals of sodium sulphide are easily converted into sodium hydrosulphide by the action of hydrogen sulphide, but the author shows that solutions of sodium sulphide will only take up sufficient hydrogen sulphide to form the hydrosulphide under certain rather restricted conditions as to concentration and temperature. Under favourable conditions, two hydrates were obtained, $NaHS, 2H_2O$, $NaHS, 3H_2O$, the latter being the stable form.

To prepare the polysulphides, sulphur was dissolved in gently heated solutions of the hydrosulphides, when the following

potassium compounds were obtained: $K_4S_5, 10H_2O$, $K_4S_8, 6H_2O$, $K_4S_8, 19H_2O$, K_4S_9, xH_2O, K_4S_{10}, xH_2O, as well as substances approximating in composition to K_4S_6 and K_4S_7.

The only sodium compound obtained in this way was $Na_4S_9, 14H_2O$.

The Action of Iodine on Alkalies. R. L. Taylor. (*Proc. Chem. Soc.*, xvi. No. 221.) The author's results indicate that the action of iodine upon alkalies in the cold always begins with formation of hypoiodite and iodide, and that the former then decomposes more or less rapidly, according to the concentration, into iodide and iodate.

Effect of Manganese in Promoting the Phosphorescence of Strontium Sulphide. J. R. Mourelo. (*Comptes Rendus*, cxxix. 1236–1238.) The effect of the manganous sulphate on the strontium sulphide is similar to that of manganous carbonate or basic bismuth nitrate; the phosphorescence becomes more intense, lasts longer, and is attained after a shorter exposure to diffused daylight. When due to manganese, the phosphorescence has a yellowish-green colour, whilst that produced by bismuth is bluish-green. Details respecting the preparation of phosphorescent strontium sulphide are given in the paper.

Barium and Strontium Phosphides. A. Jaboin. (*Pharm. Journ.*, 4th series, x. 41, from *Comptes Rendus*, cxxix. 762.) By reducing the phosphates of strontium or of barium by means of lampblack in the electric furnace, the author has succeeded in obtaining the respective phosphides in a crystalline state. *Strontium phosphide*, Sr_3P_2, which is a very stable body in dry air, occurs as a blackish mass of microscopic crystals, showing a bright, crystalline, reddish-brown fracture. Its density is 2·68; it rapidly decomposes in moist air. Hydrogen is without action on it below the fusing point of glass; it burns in chlorine at about 30° C. Bromine combines with it at 170–175° C., and iodine at a red heat. At very high temperature carbon replaces the phosphorus, so that during the preparation exposure in the electric furnace must not be prolonged. Water causes its decomposition with the formation of strontium hydrate and phosphoretted hydrogen. It is not attacked by strong acids; with oxidising agents, violent reaction takes place. *Barium phosphide*, Ba_2P_3, is analogous in all respects to the strontium compound, occurring in dark masses of minute crystals, with a brilliant fracture.

Solubility of Lime in Saccharine Liquids. J. Weisberg. (*Bull. Soc. Chim.*, 1899, 773–776.) The results of a number of

experiments on the solubility of lime in sugar solutions of different strengths at 15° and at 16–17° are given in tabular form, and compared with those obtained by Berthelot, Péligot, Petit, and Schatten. Péligot's tables, although most generally used, are considered to be the least accurate; and the solubilities given by previous experimenters are in each case lower than the values obtained by the author. The solubility increases with the amount of sugar present, but the weight of lime dissolved per 100 grammes of sugar is greater in weak than in strong sugar solution. The author confirms the observation that calcium oxide is more soluble in sugar solutions than the hydrate.

Absorption of Nitric Oxide by Ferrous Salts. V. Thomas. (*Bull. Soc. Chim.* [3], xix. 419–422.) The author has repeated and extended the experiments of Gay and Graham on the absorption of nitric oxide by ferrous salts, and confirms the results obtained by those observers. It is found that all ferrous salts, without exception, absorb nitric oxide in aqueous solution, and also when dissolved in alcohol, ether, acetic acid, or ethylenic bromide. The two latter solvents deposit ferrous salts in the anhydrous condition on evaporation, and hence it is inferred that the absorption is due to the salts themselves and not to their hydrates. The amount of nitric oxide absorbed depends on the nature of the solvent, and is greater for alcoholic than for aqueous solutions.

Action of Potassium Iodide on Mercurous Iodide. M. François. (*Journ. de Pharm.* [6], x. 16–18.) Mercurous iodide, when treated with a solution of potassium iodide, splits up into mercuric iodide and metallic mercury. The reverse action takes place when a saturated solution of mercuric iodide in potassium iodide is allowed to act on mercury, in which case mercurous iodide is formed.

Precipitation of Copper by Zinc. J. C. Shengle and E. F. Smith. (*Journ. Amer. Chem. Soc.*, 1899, 932–933.) Metallic copper obtained by precipitation with zinc always contains a small proportion of the latter. The fact that, notwithstanding this contamination, the well-known gravimetric estimation of copper based on this precipitation gives accurate results, is attributed by the authors to a balancing of errors.

Bismuth Sulphates. R. H. Adie. (*Proc. Chem. Soc.*, xv. No. 215.) The author has investigated the conditions of formation and limits of existence of the sulphates of bismuth, and has found that from sulphuric acid of any strength between these represented by

H_2SO_4, 6 H_2O and H_2SO_4, 12 H_2O, a basic bismuth sulphate having the formula 5 Bi_2O_3 11 SO_3, 17 H_2O crystallizes out; if between H_2SO_4, 3 H_2O and H_2SO_4, 5 H_2O, the sulphate may be represented as Bi_2O_3, 4 SO_3, 7 H_2O; and if the strength be between H_2SO_4, H_2O, and H_4SO_4, 2 H_2O, the salt obtained has the composition Bi_2O_3, 4 SO_3, 3 H_2O. From sulphuric acid itself, the sulphate which crystallizes out at temperatures above 170° has the formula Bi_3O_3, 4 SO_3, H_2O; if below 170°, Bi_2O_3, 4 SO_3, 10 H_2O.

This temperature (170°) is that at which the acid sulphates are decomposed when heated in an air-bath, the normal bismuth sulphate, Bi_2O_3, 3 SO_3 being formed.

Colour Change of Solutions of Chromium Salts. F. P. Venable. (*Journ. Amer. Chem. Soc.*, xxii. 111.) The author discusses the nature of the change from violet to green in solutions of chromium salts, and adheres to the opinion formerly expressed by himself and Miller, that the colour of the green solutions is due to the formation of green and uncrystallizable basic salts of chromium, as first suggested by Berzelius. It is now stated, in addition, that the formation of those salts is accompanied by the liberation of a portion of the combined acid, corresponding to one-half of the total in the case of chrome alum.

Chromium Acetate. A. Recoura. (*Comptes Rendus*, cxxix. 158-161 and 208-211.) Normal chromium acetate, $Cr(C_2H_3O_2)_3$, is obtained by mixing solutions of chromium sulphate and barium acetate, or by dissolving freshly precipitated chromium hydrate in the calculated quantity of glacial acetic acid. By the first-named process it is obtained in the form of a green solution, while the latter process yields it in the form of a crystalline mass, from which, after drying by the filter pump and afterwards on porous tiles over sulphuric acid, the solid salt, $Cr(C_2H_3O_2)_3 \cdot 5\,H_2O$, is obtained, the solution of which is identical with that obtained by the reaction of barium acetate with chromium sulphate. The solution is green, and throws down the whole of the chromium as hydrate on the addition of the calculated amount of sodium hydrate. The green solution is unstable, and very soon changes to violet; when this change is complete, the solution is no longer precipitated by alkalies. This violet "abnormal" acetate may be obtained in the solid state by the spontaneous evaporation of chromium acetate solution in presence of glacial acetic acid. Thin, brilliant, violet plates are formed, of the formula $Cr(C_2H_3O_2)_3 \cdot H_2O$, which slowly lose acetic acid to the extent of one molecule. Alkalies give no precipitate with the solution of this

substance, and of the three acetyl groups which it contains only one is displaceable by acids or alkalies. The author regards this salt as a combination of $Cr(C_2H_3O_2)_2$ with a molecule of acetic acid.

Commercial Calcium Carbide. H. Moissan. (*Bull. Soc. Chim.*, xxi. 865–871. From *Journ. Chem. Soc.*) Theoretically, 1 gramme of calcium carbide should yield 349 c.c. of acetylene. The amounts obtained from seven commercial samples varied from 292·8–318·7 c.c.; three inferior specimens, which were grey and porous, instead of having a fused, crystalline structure, gave only 228·6, 250·4, and 260·3 c.c. respectively. The gas sometimes contains notable quantities of ammonia, and several specimens of carbide yielded a little hydrogen phosphide. To facilitate the study of the insoluble residue, the carbide was decomposed with an aqueous solution of sugar, whereby the lime produced is kept in solution. The residue consists principally of the silicides of carbon, calcium, and iron, sometimes mixed with a little graphite and calcium sulphide; dilute (10 per cent.) hydrochloric acid extracts iron, lime, and small quantities of aluminium and phosphorus; the concentrated acid dissolves further quantities of lime and silica, whilst carbon silicide and graphite remain unattacked. The various forms in which these impurities exist were recognised by microscopical examination. The *silicon* occurs chiefly as carbon silicide, but small quantities of calcium silicide, silica, and a compound containing iron, carbon, and silicon are also formed. Silicon hydride, from the decomposition of calcium silicide, is often evolved in the treatment with concentrated hydrochloric acid. The total *sulphur* in three samples of carbide was found to be 0·37, 0·43, and 0·74 per cent.; it exists as calcium sulphide and aluminium sulphide. Hydrogen sulphide is not liberated when impure calcium carbide is decomposed by water, since it is retained by the calcium hydrate formed in the reaction; traces of a volatile organic compound containing sulphur seem, however, to be formed in some cases, since the gas, after being washed with potash and lead acetate solution, yields a small quantity of sulphuric acid when burnt. Iron is found as silicide and carbosilicide. Phosphorus occurs chiefly as calcium phosphide, but is also found combined with iron and silicon. Carbon is sometimes found as graphite retaining calcium and silicon; none was detected in the form of diamond.

Continuous and Uniform Generation of Pure Acetylene. J. A. Mathews. (*Journ. Amer. Chem. Soc.*, 1900, 106–108.) When

calcium carbide is covered with absolute alcohol, and water then allowed to enter drop by drop, a perfectly steady current of acetylene is obtained, which may be purified by passing it through an acidified solution of copper sulphate, and afterwards over pumice stone saturated with a sulphuric acid solution of chromic acid.

Purification of Acetylene. P. Wolff. (*Chem. News*, lxxx. 40.) The author reports favourably on Frank's method of purifying acetylene by the aid of an acid solution of copper chloride. The process is stated to give a satisfactory yield, though there is an inevitable loss of acetylene through its partial conversion into aldehyde. As an alternative process the use of chlorinated lime containing a small quantity of an alkaline chromate is proposed. In this method the free chlorine is absorbed, and the acetylene does not undergo any decomposition.

The Reaction between Potassium Ferrocyanide and Sulphuric Acid. R. H. Adie and K. C. Browning. (*Proc. Chem. Soc.*, xv. No. 215.) The authors have made a quantitative investigation of the action of sulphuric acid of concentrations varying from that of H_2SO_4 (98 per cent.) to $H_2SO_4, 8H_2O$ on potassium ferrocyanide with the following results.

The salt dissolves in acid of strengths corresponding to H_2SO_4 and H_2SO_4, H_2O, with the formation of potassium sulphate and hydroferrocyanic acid: there is only a slow and incomplete formation of carbon monoxide.

In acid of the strength represented by $H_2SO_4, 2H_2O$, the decomposition of the salt results in the formation of carbon monoxide; this reaction accounts for all the cyanogen in the salt.

With more dilute acid of the composition of from $H_2SO_4, 4H_2O$ to $H_2SO_4, 10H_2O$, the products are hydrocyanic acid and Everitt's salt, $K_2Fe_2Cy_6$. At the latter dilution, all the cyanogen in the salt appears as hydrocyanic acid, while the formation of carbon monoxide practically ceases with acid of $H_2SO_4, 4H_2O$ strength.

The authors discuss the mechanism of the reaction: (i) through the formation and hydrolysis of hydroferrocyanic acid by means of the dilute sulphuric acid; (ii) through the action of the potassium sulphate first formed on the hydroferrocyanic acid, with the intermediate formation of Everitt's salt. The latter reaction only takes place in fairly concentrated solutions, whilst the former alone occurs with acids more dilute than that represented by $H_2SO_4, 10H_2O$. Other conditions influencing the reactions are also fully discussed.

Glycerophosphates. M. Guédras. (*Chem. Centr.*, 1899, 626.) Commercial calcium glycerophosphate, $CaPO_3 \cdot O \cdot C_3H_5(OH)_2$, prepared by heating phosphoric acid with glycerin for a day at 150°, and then for 3 days at 115–125°, and treating the glycerophosphoric acid with milk of lime, is alkaline towards litmus, but neutral to phenolphthalein, dissolves in about 25 parts of water, leaving a small quantity of insoluble calcium phosphate, and is precipitated from its aqueous solution by heating. Boiling alcohol usually extracts some glycerin and phosphoric acid. Sodium and potassium glycerophosphates are syrupy liquids. The magnesium salt is a powder, and has properties similar to those of the calcium salt. The iron salt, prepared by digesting crude glycerophosphoric acid with iron dust below 60°, crystallises in leaflets which have a golden lustre. Quinine glycerophosphate, $C_3H_7O_2 \cdot O \cdot PO(OH)_2$, $(C_{20}H_{24}O_2N_2)_2 + 4\,H_2O$, is slightly soluble in water, more so in alcohol, and may be used as a substitute for quinine sulphate.

Commercial Glycerophosphates. J. H. Hoseason. (*Pharm. Journ.*, 4th series, x. 419.) The examination of a number of samples of glycerophosphates collected during the past few years yielded the following results:—

No.	Salt Examined.	Percentage of Pure Salt.*	Remarks.
		p. c.	
1	Sodium glycerophos. 75 paste . . .	74·8	Colour, pale straw
2	Do. do. 75 liquid . . .	72·2	Do. dark brown
3	Do. do. 75 paste . . .	75·5	Do. do.
4	Do. do. 50 liquid . . .	48·9	Do. do.
5	Potassium do. 75 thick liquid .	74·9	Do. pale straw
6	Do. do. 50 liquid . . .	52·3	Do. dark, contains 4 per cent. K_2HPO_4
7	Calcium do. white powder .	99·2	H_2O 8·2 per cent.
8	Do. do. do.	98·1	H_2O 9·34 per cent.
9	Do. do. yellowish powder	97·8	H_2O 9·72 per cent.
10	Iron do. scales	92·6	79·8 Fe (ous)
11	Do. do. yellow powder .	91·4	50·2 Fe (ous)
12	Quinine do. grey crys. mas .	93·3	Excessive moisture
13	Do. do. do. .	92·6	Do. do.

* Calculated from H_3PO_4 content, excepting 12 and 13, from alkaloid.

Cyanoform and Nitroform. A. Hantzsch and MM. Ostwald and Rinckenberger. (*Pharm. Journ.*, 4th series, x. 21, from *Ber.*, xxxii. 628.) Cyanoform, $H \cdot C(CN_3)$, prepared from the di-sodium salt of methylene cyanide, by acidification and treatment with ether, is, like nitroform, a very powerful monobasic

acid. It is only stable in the pure state, or in a solvent free from water, as it polymerises very readily. In watery solutions and in salts, this acid exists only as isocyanoform. Nitroform, $H \cdot C(N O_2)_3$, is obtained through treatment of potassium nitroform with strong sulphuric acid, as a colourless mass, melting at 15° C. The watery solution of this, as well as its salts, is coloured a deep yellow, owing to the formation of iso-compounds.

Preservation of Chloroform. V. Masson. (*Journ. de Pharm.*, vi. ix. 572.) The author states that the addition of 1 part of poppy seed oil to 1,000 parts of chloroform prevents the decomposition of the latter to such an extent, that the product can be kept for several years exposed to light without undergoing any change.

Determination of the Relative Proportions of Gaseous Chloroform and Air in a Mixture of the two, and a Method for producing a Mixture of Air and Chloroform in any desired Proportion. A. V. Harcourt. (*Proc. Chem. Soc.*, xv. No. 213.) To produce anæsthesia, air is inhaled mixed with a small percentage of chloroform vapour. The proportion of chloroform most suitable for this purpose has not been determined, probably for want of a good chemical method of making this determination. The reaction which takes place between chloroform and a hot alcoholic solution of potash, $C H Cl_3 + 4 K O H = 3 K Cl + H C O_2 K + 2 H_2 O$, seemed to furnish a basis for such a method. However, with regard to this reaction, two statements have been made, that all the chlorine of chloroform can thus be converted into a chloride, and that it cannot. The author has worked out and described a method for removing chloroform vapour from air, and obtaining chloride from it by means of the above reaction; but on applying the method to weighed quantities of chloroform the results were always about 4 per cent. too low. This error is so nearly constant that the method may be used, and the results increased by 4 per cent.

Another and better method devised by the author is based on the following reaction:—

When the mixture of air and chloroform is mixed with a certain proportion of steam by heating it with a few c.c. of water to 50° or 60°, and a platinum wire is kept in a state of incandescence in this mixture, the whole of the chloroform undergoes the following change: $2 C H Cl_3 + 2 H_2 O + O_2 = 6 H Cl + 2 C O_2$. With a fairly bright wire the change is complete in an hour, and the hydrogen chloride may be obtained in dilute solution by bringing in 20 c.c. of water, and may be determined in the flask with a standard solution of ammonia. If enough steam is not present, or the plati-

num wire is not heated beyond a low incandescence, or sufficient time is not allowed, a smell of chlorine will be observed at the mouth of the flask and the result will be too low. It was ascertained incidentally that a weighed quantity of chlorine, treated as above, is completely converted into hydrogen chloride.

The author also describes a method of producing a mixture of air and chloroform in any desired proportion and of constant composition. This consists in blowing air through a mixture of chloroform and alcohol. The density of the liquid, showing the proportion of its ingredients, could be observed during the passage of the air by means of two little glass bulbs, of which one floated and one sank when the density was right, and could be adjusted by additions of chloroform. Density and temperature being constant, the proportion of chloroform taken up by the air was constant also. To remove alcohol vapour, the current of air was then passed through two wash-bottles containing sulphuric acid and water respectively.

Melting Point of Chloral Hydrate. C. G. L. Wolf. (*Journ. Physical Chem.*, 1900, 21.) The author has examined the phenomena of fusion of chloral hydrate, and considers that the variations observed in the melting point are not due to the existence of two modifications, but to dissociation, and that only one form of the compound exists in the melted mass, both the forms obtained by Pope giving similar results. The temperature at which the undissociated compound, the dissociation products, and the liquid are in equilibrium is about 47°, but the melting point for the undissociated compound itself is above 72°, at which temperature its vapour pressure is about 22 mm.

Aromatic Spirit of Ammonia. E. White. (*Pharm. Journ.*, 4th series, x. 144–148; *Chem. and Drugg.*, lvi. 209–210.) The author points out that the B.P. statement that the strong solution of ammonia of 0·891 specific gravity contains 32·51 per cent. of ammonia gas is erroneous. His own determinations accord very well with those of Lunge and Wiernik, and are shown in the following table:—

Lunge and Wiernik.		White.	
Sp. Gr.	Percentage NH_3.	Sp. Gr.	Percentage NH_3.
0·890	31·75	0·8893	32·19
0·892	31·05	0·8902	31·85
—	—	0·8916	31·42

With regard to ammonium carbonate the B.P. of 1898 requires that 1 gramme should require for neutralisation at least 18·7 c.c. of standard sulphuric acid. The author has not been able to obtain a sample of the salt which came up to the B.P. requirements, his own estimations coming out the highest at 18·2 c.c. and the lowest 16·8 c.c. By adding excess of acid and re-titrating, slightly higher results were obtained. Squire had previously observed that different samples he tested only gave from 91 to 96 per cent. of the required amount.

With regard to the total alkalinity of aromatic spirit of ammonia, the official statement is that 20 c.c. of this preparation shall require 26·5 c.c. of standard sulphuric acid for neutralisation. This is the calculated amount, but the author found the actual quantities required in three experiments to be 25·5 c.c., 26·2 c.c., and 25·3 c.c. To meet the B.P. requirements it was only necessary to add a little more strong solution of ammonia.

The official process for the estimation of ammonium carbonate in aromatic spirit of ammonia is based upon the reaction between this salt and barium chloride, and was originally devised by Thresh. The author's experiments, of which full details will be found in his paper, show, however, that this process possesses inherent defects impairing its accuracy, and that the precipitation of barium carbonate by barium chloride in the presence of ammonium salts does not form a satisfactory basis for the determination of ammonium carbonate in this preparation. As an alternative process the author discusses Gravill's suggestion, to effect the determination of the carbonate by measuring the carbon dioxide evolved on treatment with acid over mercury in a nitrometer. His experiments in this direction lead him to infer that, with due attention to all the points involved, a trustworthy process may be based on this suggestion.

In conclusion, the author points out that the condition of the ammonium carbonate, as to age and reduction of total alkalinity, has little or no effect upon the carbonate value of the salt, since the molecular weights of the carbamate and the acid carbonate of ammonium are so nearly alike, and as one molecule of either of these constituents of the commercial salt yields one molecule of normal carbonate when dissolved in water in the presence of ammonia. Hence, if the correct weight of the commercial salt be introduced, no deficiency of carbonate will occur in the product.

A New Compound of Mercuric Chloride and Antipyrine. J. Ville and C. Astre. (*Comptes Rendus*, cxxx. 837–840.) The authors

describe a compound of the formula $(C_{11}H_{12}ON_2)_2, HHgCl_3$, which is obtained when a solution of mercuric chloride, containing also sodium chloride and hydrochloric acid, is added slowly to an aqueous solution of antipyrine. It forms rhomboidal lamellæ, which melt at 105–106°, and dissolve readily in chloroform. Its solutions give the ordinary reactions of mercuric salts and of antipyrine, but are not precipitated by sodium carbonate or bicarbonate; with potassium iodide they yield a pale yellowish precipitate, soluble in an excess of the reagent, with which it forms a yellow solution. In the latter reactions, and also in its behaviour with stannous chloride and auric chloride, this compound differs from that described by Hirsch and by Schuyten.

Iodoantipyrine. J. Bougault. (*Journ. de Pharm.* [6], xi. 100–102.) Pure iodoantipyrine can be readily prepared by adding iodine, dissolved in a solution of potassium iodide, to a boiling solution of antipyrine and sodium acetate in water. On cooling the mixture, the iodoantipyrine is precipitated in almost theoretical amount.

Japaconitine and the Alkaloids of Japanese Aconite. W. R. Dunstan and H. M. Read. (*Proc. Chem. Soc.*, xv. No. 214.) The authors have investigated the properties of the alkaloids of Japanese aconite, *A. Fischeri* ("kuza uzu"), including those of japaconitine, the crystalline toxic alkaloid examined by Wright and Luff in 1879, who assigned to it the formula $C_{66}H_{98}N_2O_{21}$. Later workers, Mandelin, Lübbe, and, more recently, Freund and Beck, have asserted that japaconitine is identical with aconitine, the crystalline toxic alkaloid of *Aconitum Napellus*.

The results obtained in the present investigation do not confirm these statements, but lead to the conclusion that japaconitine is a distinct alkaloid, the composition and properties of which, however, do not agree with those ascribed to it by Wright and Luff.

Japaconitine crystallises in colourless needles which melt at 204·5° (corr.). The crystallographic characters differ from those of aconitine. The base is soluble in acetone, alcohol, chloroform, and in ether, but almost insoluble in water and light petroleum. Its physiological action closely resembles that of aconitine. It contains four methoxyl groups, one acetyl group, and one benzoyl group. Its composition is provisionally represented by the formula $C_{21}H_{29}(OCH_3)_4(CH_3CO)(C_6H_5CO)NO_3$, which seems to agree best with the analytical data for the base and its derivatives. Japaconitine furnishes a series of well crystallised salts, of which the *hydrochloride* (m. p. 149–150°), the *hydrobromide* (m. p. 172–

173°), the *hydriodide* (m. p. 207–208°), the *aurichloride* (m. p. 231°), and the *nitrate* (m. p. 194°) are described. Like aconitine, japaconitine is dextrorotatory, the salts being lævorotatory. The specific rotation of japaconitine is, however, much greater than that of aconitine.

When partially hydrolysed by dilute acids, japaconitine furnishes acetic acid, and a new crystalline base, *japbenzaconine*, in accordance with the equation $C_{34}H_{49}NO_{11} + H_2O = C_{32}H_{47}NO_{10} + C_2H_4O_2$. It crystallises in rectangular plates which melt at 182–183°. Its lævorotation is nearly twice that of benzaconine. The salts crystallise with extreme readiness. The *hydrochloride* (m. p. 253°), the *hydrobromide* (m. p. 205°), the *aurichloride* (m. p. 228°), and the colourless *aurichlor*-derivative (m. p. 178°) are described.

Japbenzaconine is hydrolysed on treatment with acids or alkalies, yielding benzoic acid and a base, *japaconine*, in accordance with the equation $C_{32}H_{47}NO_{10} + H_2O = C_{25}H_{43}NO_9 + C_7H_6O_2$. Japaconine has been obtained only in an amorphous condition, even the salts crystallise with great difficulty. The *hydrobromide* melts at 221°.

When japaconitine melts, it gradually suffers decomposition into acetic acid, and a new crystalline base, *pyrojapaconitine*, $C_{32}H_{45}NO_9$. The crystalline *hydrochloride* (m. p. 175–176°), *hydrobromide* (m. p. 208°, or in another form at 241°), and *aurichloride* (m. p. 161°) are described. Both pyrojapaconitine and its salts are strongly lævorotatory.

Pyrojapaconitine is readily hydrolysed by alkalies or acids, yielding *benzoic acid* and *pyrojapaconine*, $C_{25}H_{41}NO_8$. Neither the base nor its salts have been crystallised.

Japaconitine yields a *triacetyl* derivative; and also a *monomethyl* derivative by decomposition of the *methiodide* with potash.

It is evident that the properties of japaconitine and its derivatives are distinct from those of aconitine and its derivatives, although there is a strong general resemblance between the two groups.

Besides the crystalline japaconitine, Japanese aconite roots were found to contain a small proportion of its first hydrolytic product, japbenzaconine.

Atropine and Hyoscyamine. O. Hesse. (*Liebig's Annalen*, cccix. 75.) A specimen of atropine has been obtained from the root of *Scopolia atropoides* entirely devoid of optical activity; it melts at 115·5–116°, and the hydrobromide and hydrochloride, which are

also inactive, melt at 162° and 165° respectively. The aurichloride and oxalate melt at 136° and 190–191° respectively. Gadamer has also prepared inactive atropine, attributing the activity of the commercial alkaloid to the presence of hyoscyamine, and this has been found by the author to be the explanation. The rotatory power diminishes when the alkaloid is kept in the free condition, but the activity of the sulphate undergoes no change. Atropine aurichloride, contaminated with hyoscyamine aurichloride, becomes transformed into the latter in two years; the individual salt, however, undergoes no change. The rotatory power of hyoscyamine also changes when the free alkaloid is kept, but the sulphate does not alter.

Atropine Sulphate. J. C. Umney. (*Pharm. Journ.*, 4th series, x. 8.) The author states that considerable difficulty is experienced in obtaining atropine sulphate melting at 183° C., the removal of all traces of hyoscyamine sulphate being costly and of but little advantage. Practically all the atropine sulphate of commerce melts at 186° to 187° C., but otherwise it corresponds to the official characters and tests, and yields a base melting at 115° C.

Microscopic Identification of the Mydriatic Alkaloids. S. Vreven. (*Amer. Journ. Pharm.*, 1900, 76, 77, from *Ann. de Pharm.*, Louvain, 1899, 1.) The author has microscopically examined the precipitates formed by these bases with the different alkaloid reagents, and finds that the crystalline precipitates produced with potassio-cadmium iodide and with picric acid exhibit very characteristic features, by which they can be readily identified. A description of these characters, illustrated by woodcuts, will be found in the original paper, which should be consulted.

The author also finds that the melting point of the potassio-cadmium iodide precipitates of the different alkaloids affords a valuable aid to identification. The atropine precipitate melts at 95° C., while the hyoscyamine, daturine, and duboisine precipitates all melt at 86–87° C.

Quinine Acetate. C. R. Hill. (*Pharm. Journ.*, 4th series, x. 416-417; *Chemist and Druggist*, lvi. 664.) This salt, which is not much known, is found by the author to have a composition corresponding to the formula $C_{20}H_{24}N_2O_2, C_2H_4O_2, H_2O$. It is soluble in 52 parts of cold water and freely soluble in hot water. Its solubility in 90 per cent. alcohol is nearly 1 in 7 by weight (1 in 8·5 by volume), in chloroform about 1 in 12 (1 in 8 by volume), in ether about 1 in 130 (1 in 172 by volume), and in absolute ether about 1 in 390 (1 in 542 by volume).

When excess of ammonium-acetate solution is added to a saturated aqueous solution of quinine acetate, a very bulky precipitate of quinine hydrate is formed, which gradually causes the mixture to become almost solid. The same result happens even in presence of an excess of free acetic acid. This explains the precipitation which has been noticed in mixtures containing quinine sulphate and ammonium acetate.

Separation of Brucine from Strychnine. W. Stoeder. (*Chem. Centr.*, 1899, 506.) The author finds that the separation of these bases by means of potassium ferrocyanide in a sulphuric acid solution is untrustworthy, but that good results may be obtained by Keller's method. The crude alkaloids, weighing about 0·3 gramme, are dissolved in 10 c.c. of 10 per cent. sulphuric acid, 1·5 c.c. of 50 per cent. nitric acid is added, and the mixture left for 1½ hours. The brucine is thus converted into dinitrobrucine, and the strychnine may be extracted by agitating the liquid with chloroform, after rendering alkaline with ammonia.

Solubility of Strychnine Salts in Chloroform. J. R. Hill. (*Pharm. Journ.*, 4th series, x. 185.) One of the chief methods of analysis for separating strychnine from other substances is based on the assumption that, while the free alkaloid is readily soluble in chloroform, its salts are insoluble. The author's experiments show that the latter assumption is only true to a limited extent, and applies strictly only to the sulphate when a distinct excess of sulphuric acid is present.

Researches on Morphine. S. B. Schryver and F. H. Lees. (*Proc. Chem. Soc.*, xvi. 226.) The authors have found that the alcoholic hydroxyl group in morphine is readily replaceable, and they have prepared the compounds described below.

Chloromorphide, $C_{17}H_{18}O_2NCl$, prepared by the action of phosphorus trichloride on dry morphine. It melts at 190° with decomposition, and dissolves readily in chloroform and in methyl alcohol. The *hydrochloride*, $C_{17}H_{18}O_2NCl, HCl$, and *hydrobromide*, $C_{17}H_{18}O_2NCl, HBr$, have also been prepared. On treatment with acetic anhydride, the *monoacetyl* derivative, $C_{17}H_{17}O(OC_2H_3O)NCl$, is obtained melting at 178–179°.

Bromomorphide, $C_{17}H_{18}O_2NBr$, melting with decomposition at 170°, has a very bitter taste and dissolves readily in chloroform and benzene. Its *hydrochloride* and *hydrobromide* crystallise with one molecule of water. Bromomorphide can also be prepared by the action of concentrated hydrobromic acid on morphine.

By treating chloromorphide with tin and hydrochloric acid,

desoxymorphine hydrochloride, $2(C_{17}H_{19}O_2NHCl), 3H_2O$, is obtained as glistening needles. The salt is lævorotatory; $[\alpha]_D^{27} = -140{\cdot}3°$.

It was found that on heating chloro- and bromo-morphide and their hydrochlorides with water, decomposition took place, bromomorphide giving the hydrobromide of a base isomeric with morphine; for this new base the authors propose the name *isomorphine*. Isomorphine and its derivatives are more powerfully lævorotatory than morphine and its corresponding derivatives. The salts of isomorphine are much more readily soluble than those of morphine. Isomorphine melts at 246–247°, is readily soluble in methyl alcohol, but only very sparingly so in ether, chloroform, or benzene. Recrystallised from hot water, it is obtained as glistening needles. In methyl alcohol, $[\alpha]_D^{25} = -164{\cdot}3°$. For the *hydrochloride*, $C_{17}H_{19}O_3N, HCl$, $[\alpha]_D^{25°} = -150°$; for the *hydrobromide*, $C_{17}H_{19}O_3N, HBr, H_2O$, $[\alpha]_D^{20} = -127{\cdot}2°$ for the anhydrous salt. The *methiodide*, $C_{17}H_{19}O_3N, CH_3I$, melts with vigorous decomposition at 279°; in aqueous solution, $[\alpha]_D^{25} = -91{\cdot}5°$. Morphine methiodide also melts at 279°; $[\alpha]_D = -72{\cdot}9°$.

By treatment of isomorphine methiodide in aqueous solution with silver sulphate and barium hydrate, a very alkaline solution of the hydrate is obtained, which, dried in a vacuum, sets first to a deliquescent mass of fern-like crystals, and on further dehydration in a vacuum yields a solid which can readily be powdered. This substance dissolved in methyl alcohol does not react in the cold with methyl iodide, but does so readily on warming, giving a methiodide extremely soluble in water and in methyl alcohol, but only slightly so in ethyl alcohol. $[\alpha]_D^{25} = -96{\cdot}4°$. This compound is not identical with codeine methiodide.

The determinations recorded in the following table were made with the free bases dissolved in methyl alcohol, and the salts (anhydrous) in water:—

	Free base.	Hydrochloride.	Hydrobromide.
Morphine	$[\alpha]_D^{23} = -130{\cdot}9°$	$[\alpha]_D^{26} = -111{\cdot}5°$	$[\alpha]_D^{20} = -100{\cdot}4°$
Chloromorphide ..	$[\alpha]_D^{27} = -375{\cdot}2$	$[\alpha]_D^{21} = -313{\cdot}7$	$[\alpha]_D^{19} = -268{\cdot}6$
Bromomorphide ..	$[\alpha]_D^{25} = +65{\cdot}6$	$[\alpha]_D^{27} = +41{\cdot}1$	$[\alpha]_D^{25} = +39{\cdot}5$

Chloromorphide, bromomorphide, desoxymorphine, and isomorphine are all devoid of narcotic action. The significance of these

facts and the relationship between morphine and isomorphine were also discussed.

Dionin, the New Morphine Derivative. L. Hesse. (*Chem. Centr.*, 1899, 430). A previous notice of dionin, ethylmorphine hydrochloride, will be found in the *Year-Book of Pharmacy*, 1899, 223–224.

The author points out that ethylmorphine can scarcely be distinguished from codeine by its colour reactions, but whilst codeine is precipitated from 5 c.c. of a 10 per cent. solution of its hydrochloride by adding a few drops of ammonia solution of sp. gr. 0·91, and is permanently dissolved when 1 c.c. of ammonia is added, ethylmorphine when precipitated in a similar manner is only dissolved by 5 c.c. of ammonia, and the solution after a short time deposits crystals which melt at 93°; this precipitation is evident, even in solutions containing only 1 per cent.

Nitrogen-Free Decomposition Products of Morphine. E. v. Gerichten. (*Ber. der deutsch. chem. Ges.*, 1900, 352–359. From *Journ. Soc. Chem. Ind.*) Morphenol and acetylmorphenol do not give phthalic acid on oxidation. This is an argument against the author's formula for morphenol. The quinone formed by the oxidation of acetylmorphenol by chromic acid has now been obtained in some quantity. It unites with *o*-toluylenediamine to form the compound $C_{23}H_{14}N_2O_3$, which crystallises in small needles melting at 231–232° C. Morphenol is reduced by zinc dust to phenanthrene, and by sodium is converted into morphol, which may be oxidised to morpholquinone, and this converted into a body related to alizarin, and acting as a polygenetic dyestuff on mordanted fibres.

Benzoylmorphenol may be obtained by Schotten and Baumann's method in almost quantitative yield; it crystallises from glacial acetic acid in small colourless wart-like masses, melting at 123° C.

Bromacetylmorphenol melting at 208° is obtained by the action of bromine on acetylmorphenol in chloroform solution. *Morphenol* is obtained from its methyl ether by heating in the oil-bath at 130–135° C. for 1–1½ hours with acetic and hydriodic acids, treating with water containing bisulphite, filtering, washing, dissolving in caustic soda, filtering, acidifying, and extracting. The yield is about 90 per cent. of the methyl ether.

Heroine (Diacetoxymorphine). G. Wesenberg. (*Journ. Chem. Soc.*, 1899, 650, from *Chem. Centr.*) Heroine, $C_{17}H_{17}NO(OAc)_2$, (see *Year-Book of Pharmacy*, 1899, 228), is a white, crystalline,

odourless powder, has an alkaline reaction, melts at 173°, is almost insoluble in water, slightly soluble in cold alcohol and ether, and easily in chloroform, benzene, hot alcohol, and acids. The normal salts are hygroscopic and difficult to crystallise, whilst the acid salts, like the acid oxalate, generally crystallise well. The ordinary alkaloidal reagents form precipitates with solutions of the normal salts, a solution of iodine in potassium iodide giving a distinct turbidity with a solution containing only one part in 100,000. The colour reactions of morphine are also shown by diacetoxymorphine, but the blue coloration with potassium ferricyanide and ferric chloride is only formed after some time and nitric acid gives a yellow coloration. When treated with iodic acid, the diacetoxy-derivative, unlike morphine, does not liberate iodine, and when digested with pepsin-hydrochloric acid containing 0·2 per cent. of acid, about a fourth part is decomposed into morphine and acetic acid.

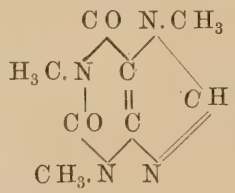
Narcotine and Narceine. G. B. Frankforter and F. H. Keller. (*Amer. Chem. Journ.*, xxii. 61–67.) Roser (*Annalen*, 1888, ccxlvii. 168) has stated that dimethyltolueneazammonium silver iodide, $C_7H_6Me_2N_3I, 2AgI$ (Zincke and Lawson *Annalen*, 1886, ccxl. 128), is formed in converting narcotine into narceine; the compound obtained from narcotine, however, melts at 184–186°, whilst that of Zincke and Lawson melted at 128–130°. The authors' analyses indicate that the substance obtained by Roser, if an azimido-compound, probably has the composition

$$C_7H_6Me_2N_3Cl, 2AgI.$$

A better method than that given by Roser for converting narcotine methiodide into the methochloride, and thence into narceine, consists in adding chlorine water to its alcoholic solution; a brown, microcrystalline precipitate of *di-iodonarcotine methiodide*, $C_{22}H_{21}I_2NO_7, MeI$, is obtained, whilst narcotine methiodide passes into solution, and can be isolated by evaporation. The action apparently takes place nearly quantitatively. Di-iodonarcotine methiodide crystallises from methylic or ethylic alcohol in slender needles, melts at 149°, and is converted by heating with an excess of chlorine water into *di-iodomethylnornarcotine methiodide*, $C_{20}H_{27}I_2NO_7, MeI$, which crystallises from alcohol in reddish-brown monoclinic crystals and melts at 186°; in this conversion, it is probable that the methoxyl group which is present in the isoquinoline nucleus remains intact.

Narceine. E. Leroy. (*Comptes Rendus*, cxxix. 1259–1261.) Thermo-chemical measurements (of hydration, combustion, and formation) indicate that narceine is the weakest of the opium bases; it stands even below narcotine, and, like that base, is neutral to litmus. It acts on potassium hydrate to form a potassium compound, with evolution of 16·7 cal., a figure below that of the salts of potassium with such acids as acetic or benzoic, but above that of the phenates. Hence narceine has a distinct acid function.

Diazocaffeine. M. Gomberg. (*Amer. Chem. Journ.*, 1900, 51–69. From *Journ. Soc. Chem. Ind.*) Although caffeine is usually regarded as an aliphatic substance, it behaves in many of its reactions more like an aromatic compound. According to recent researches (*Ber.* xxx. 553) its constitutional formula is :—



and its amido compound, in which the amido group is attached to the tertiary carbon atom, gives an unstable diazocaffeine, on treatment with nitrous acid. This substance has hitherto only been obtained in solution, but combines readily with aromatic amines and phenols. It will also combine with certain aliphatic compounds, and gives with aceto-acetic ester a derivative which crystallises from chloroform in dark blue crystals with a greenish reflex. The substance is said to possess in a high degree the properties of a dyestuff, and dissolves in water to a reddish-violet solution, which becomes deep blue when warmed, returning to the original colour on cooling. The author regards it as a diazo compound.

Amidocaffeine (obtained by heating chlorocaffeine and alcoholic ammonia in an autoclave to 150–160° C.) is best diazotised by dissolving it in 5 times its weight of hydrochloric acid (sp. gr. 1·2), cooling to − 18° C., and running in sodium nitrite solution at − 10° C., with vigorous agitation. The strongly yellow solution of the diazo compound remains clear for an hour if kept in a freezing mixture, but will not yield an insoluble salt, nor could it be reduced to the hydrazine by stannous chloride. It appears to form normal azo compounds with phenol, dimethylaniline, and *m*-

phenylene diamine, whilst it is noteworthy that the azo compound obtained by combining it with β-naphthol is said to be soluble to a deep red solution in hot dilute alkali hydrate.

Pilocarpine and the Alkaloids of Jaborandi Leaves. H. A. D. Jowett. (*Proc. Chem. Soc.*, xvi. No. 220.) On account of the doubts expressed by Kundsen, Merck, and others as to the reliability of the work of Hardy and Calmels on this subject, and the recent conflicting statements of Petit and Polonowsky and of Merck, the author has undertaken a complete study of these alkaloids. The present paper deals with the characterisation of pilocarpine, isopilocarpine (pilocarpidine of Petit and Polonowsky), pilocarpidine and jaborine, with a few preliminary experiments on the constitution of pilocarpine. The results, which are given in detail in the paper, are briefly summarised as follows :—

1. The original papers of Hardy and Calmels are very unsatisfactory, as they contain neither physical constants nor analyses of the products described. In most cases, the author is unable to confirm their results. On the other hand, a satisfactory explanation is afforded of the apparent contradiction between the work of Petit and Polonowsky and that of Merck.

2. The physical constants and description of the salts of pilocarpine, as given by Petit and Polonowsky, are generally confirmed, though in several cases there are slight differences, due probably to the use of purer material by the author.

3. The acid character of pilocarpine has been investigated and the previous work of Hardy and Calmels on this subject corrected.

4. The existence of a base, isomeric with pilocarpine, and produced from it by the action of heat or alkali, as previously stated by Petit and Polonowsky, is confirmed. As this base is isomeric with and bears a close relation to pilocarpine, it is proposed to call it isopilocarpine, as the term pilocarpidine, previously used for it, must be retained for the product previously described by Harnack under this name. It is shown that isopilocarpine can be distilled unchanged in a vacuum.

5. Some of the physical constants of isopilocarpine and its salts, as given by Petit and Polonowsky, are confirmed, and others corrected.

6. Proof is given of the existence of isopilocarpine in jaborandi leaves and in the pilocarpine nitrate of commerce.

7. The existence of the pilocarpidine of Harnack and Merck, and their statements regarding its composition, are confirmed. Some of the salts of the base are described.

8. The absence of pilocarpidine in the pilocarpine nitrate of commerce and in the varieties of jaborandi leaves at present in the market is proved.

9. The jaborine of commerce is shown to be a mixture of isopilocarpine, pilocarpidine, and a trace of pilocarpine with colouring matter. No evidence has been obtained of the existence of an alkaloid with the properties of jaborine, or of any other than those described in this paper.

10. Several experiments on the constitution of pilocarpine have been repeated, and the results of Hardy and Calmels corrected.

Further experiments on this subject are in progress.

The author has been unable to obtain any evidence confirmatory of the constitutional formula which was proposed by Hardy and Calmels and widely adopted.

The Alkaloids of Anhalonium Lewinii. E. Kauder. (*Archiv. der Pharm.*, ccxxxvii. 190–198.) The author has further investigated these bases, which have been previously reported upon by Heffter. "Mescal buttons" were extracted with alcohol, the extract was freed from fat, and shaken with ammonia and chloroform, when a resin separated. The chloroform solution was shaken with water containing sulphuric acid, and the alkaloids so removed were separated into two groups, those of the first being readily soluble in ether, those of the second only slightly soluble in ether, but readily in chloroform. The alkaloids of the first group were separated by crystallisation of their hydrochlorides from absolute alcohol; anhalonine separated first, then pellotine, and finally lophophorine. The alkaloids of the second group were converted into sulphates, and these crystallised from water; mezcaline sulphate crystallised first. The succeeding crystallisations were shaken with ammonia and chloroform; a new alkaloid, *anhalamine*, remained undissolved. The alkaloids which dissolved were converted into hydrochlorides and heated with absolute alcohol; the hydrochloride of mezcaline went into solution, whilst that of anhalonidine remained undissolved.

Anhalamine melts at 186°, and is a strong base. It dissolves to some extent in boiling chloroform and benzene, and the solutions solidify to a gelatinous mass as they cool.

Double Salts of Nicotine Hydrochloride and Cadmium Chloride. C. Glaser. (*Journ. Soc. Chem. Ind.*, 1899, xviii. 563.) When an alcoholic solution of nicotine hydrochloride is added to a large excess of an alcoholic solution of cadmium chloride, the compound $(C_{10}H_{14}N_2, 2HCl)_5, 7CdCl_2$ is obtained; this crystallises from

alcohol in kidney-shaped masses. If, however, the proportions are reversed, a compound $(C_{10}H_{14}N_2, 2HCl)_2$, $3CdCl_2 + 2H_2O$, is obtained, which crystallises from 50 per cent. alcohol in radiate clusters of fine needles and thin plates.

Ricinine. T. Evans. (*Journ. Amer. Chem. Soc.*, xxii. 39.) In isolating this principle from the seeds of *Ricinus communis* by Tuson's method, the author has found it advantageous to use toluol in the place of alcohol for extracting the residue from the evaporation of the aqueous extract. The crystals obtained from the toluol solution are re-crystallised from alcohol. Ricinine is thus obtained in small plates melting at 193° C. The analytical results agree fairly well with those obtained by Schulze, and point to the composition $C_{16}H_{16}O_4N_4$. A dibromide is obtained when ricinine is treated with bromine in either aqueous or chloroform solutions; it crystallises in long, brittle needles melting and decomposing at 230°, and is only sparingly soluble in most solvents.

When ricinine is oxidised with potassium permanganate in alkaline solution, it yields an acid crystallising in colourless needles, which melt at 279–280°, but turn black a few degrees below their melting point. A second oxidation product crystallising in red prisms and soluble in benzol to a reddish-yellow solution, with a green fluorescence, has also been obtained.

Digitoxin, Digitalin, and Digitalein. H. Kiliani. (*Archiv. der Pharm.*, 1899, 446.) The author has continued his researches on the digitalis principles. He now reports that the formula of digitoxin is $C_{34}H_{54}O_{11}$, and that its hydrolysis is represented by the equation:—

$$\underset{\text{Digitoxin.}}{C_{34}H_{54}O_{11}} + H_2O = \underset{\text{Digitoxigenin.}}{C_{22}H_{32}O_4} + 2\,\underset{\text{Digitoxose.}}{C_6H_{12}O_4}.$$

"Digitalinum verum" appears to have the composition $C_{35}H_{56}O_{14}$, or possibly $C_{36}H_{58}O_{14}$. Its decomposition may be represented by the equation:—

$$\underset{\text{Digitalin.}}{C_{35}H_{56}O_{14}} = \underset{\text{Digitaligenin.}}{C_{22}H_{30}O_3} + \underset{\text{Dextrose.}}{C_6H_{12}O_6} + \underset{\text{Digitalose.}}{C_7H_{14}O_5}.$$

Digitalein is still under investigation. It is contained in commercial digitalin, and occurs in both the infusion and tincture of digitalis. The infusion from 10 kilos of leaves yielded 2 grammes of a product, 0·6 milligramme of which produced systole in the frog; while the alcoholic extract from 10 kilos yielded 150 grammes of a body producing systole in doses of 1·5 milligrammes.

A Yellow Colouring Matter in Digitalis Purpurea. F. Fleischer. (*Ber. der deutsch. chem. Ges.*, xxxii. 1184–1190.) *Digitoflavone*, $C_{15}H_{10}O_6 + H_2O$, isolated from the leaves of *Digitalis purpurea*, separates from 70 per cent. alcohol in yellow crystals, becomes anhydrous at 150°, and melts when rapidly heated to 320°, but if heated gradually chars at 300°; it dissolves in acetone and acetic acid, and less rapidly in ether, but it is only very slightly soluble in boiling water. It is not a glucoside, does not interact with phenylhydrazine, and does not contain any methoxy-groups, but behaves as a trivalent phenol. Like the members of the quercetin group, digitoflavone forms additive compounds with mineral acids, which are decomposed by water.

A Yellow Colouring Matter in Digitalis Lutea. H. Adrian and A. Trillat. (*Comptes Rendus*, cxxix. 889.) The examination of a residue obtained in the preparation of digitalin from *Digitalis lutea* has led to the isolation of a yellow colouring principle of the formula $C_{16}H_{12}O_4$, which the authors regard as distinct from Fleischer's digitoflavone (see preceding abstract). It crystallises in shining yellow needles, which melt at 217–218°, and are soluble in alcohol, amyl alcohol, and chloroform, but insoluble in water, dilute acids and petroleum ether. It is not decomposed by boiling with hydrochloric acid, and does not react with phenylydrazine. Its colour is changed to red by alkalies.

The Yellow Colouring Principles of Various Tannin Matters. A. G. Perkin. (*Proc. Chem. Soc.*, xvi. No. 219.) The colouring matter of the leaves of *Arctostaphylos uva-ursi* (bearberry) and *Hæmatoxylon Campeachianum* (logwood) is *quercetin*, and this is accompanied by a second substance, probably *myricetin*, to which the green colour of its alkaline solutions are due. *Gallotannic acid* occurs in some quantity in the latter leaves. The leaves of *Rhus metopium* contain *gallotannin*, *myricetin*, and a trace of *quercetin*, but the stem of this plant, unlike *R. cotinus* and *R. rhodanthema*, is devoid of colouring matter. The sparing solubilities of acetylmyricetin and dibromoquercetin have been employed for the separation of myricetin and quercetin. The leaves of *Robinia pseudacacia* contain a feeble colouring matter, *acacetin*, $C_{16}H_{12}O_5$, which yields an *acetyl* derivative, $C_{16}H_{10}O_5(C_2H_3O)_2$, colourless needles, m. p. 195–198°, and on fusion with alkali *phloroglucinol*, p-*hydroxybenzoic acid*, and a trace of *protocatechuic acid*. Acacetin contains one methoxyl group, on removal of which a colouring matter, $C_{15}H_{10}O_5$, results, having the reactions of apigenin. It is

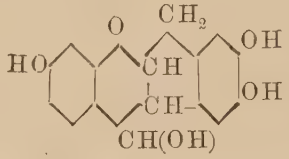
thus probably an *apigenin monomethyl ether*. The leaves of *Myrica gale* and *Coriaria myrtifolia* contain respectively *myricetin* and *quercetin*. Although a relationship frequently exists between the tanning and the colouring matters of the same plant, there seems to be no rule on this point, for exceptions are rather numerous.

Xanthorhamnin, Rhamninose and Rhamninase. C. and G. Tanret. (*Comptes Rendus*, cxxix. 725–728, and *Bull. Soc. Chem.*, xxi. 1073–1075.) It has been previously shown that xanthorhamnin, the glucoside of *Rhamnus infectoria*, is converted by the action of dilute acids into a mixture of rhamnetin, rhamnose, and galactose, the last-named compounds being themselves the products of hydrolysis of an intermediate saccharose, for which the name *rhamninose* is now proposed. Rhamninose, which is best obtained by the action of the ferment rhamnase, or, as it is more properly termed, rhamninase, on xanthorhamnin at 70°, is slowly hydrolysed by dilute acids into two mols. of rhamnose and one of galactose. It has a slightly sweet taste, and is soluble in all proportions in water, and very soluble in strong alcohol. It has a rotatory power $[\alpha]_D - 41°$, and melts and slowly decomposes at 140°; it has not been obtained crystalline. Rhamninose has one-third the reducing power of dextrose.

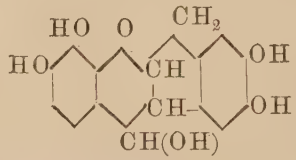
The ferment *rhamninase* is precipitated by alcohol from the cold water extract of the fruit of *Rhamnus infectoria* as a pasty mass containing 28–50 per cent. of solid matter; it is very soluble in water, and its activity does not diminish appreciably on keeping. The dry substance contains mineral salts (17 per cent.), substances coagulated by heat (53 per cent.), and galactan. A temperature of 70° is most favourable to the action of the enzyme, which is destroyed at 85°.

When xanthorhamnin is heated with water at 50°, a pale yellow, crystalline precipitate is gradually formed, quite different from that produced by the action of rhamninase. This substance is a new glucoside, which has a composition very similar to that of xanthorhamnin, but differs from it in not being acted on by rhamninase and in yielding a larger proportion of rhamnose on hydrolysis. The solution, from which the insoluble glucoside has been deposited, contains a substance, *xanthorhamnein*, which differs from xanthorhamnin in being more soluble and in having a higher rotatory power ($[\alpha]_D + 5°$ instead of $+3°{\cdot}75$). Schützenberger's observations on the existence of two modifications of xanthorhamnin are thus confirmed.

Brasilin and Hæmatoxylin. A. W. Gilbody, W. H. Perkin, jun. and J. Yates. (*Proc. Chem. Soc.*, No. 216, 241, and No. 223, 105–108.) The authors' experiments show that whereas brasilin is a derivative of resorcinol and catechol, hæmatoxylin is a derivative of pyrogallol and catechol. Both form metahemipinic acid on oxidation with potassium permanganate. A number of other oxidation products and their derivatives are described, and the opinion is expressed that brasilin probably has the constitution represented by the formula—



while the constitution of hæmatoxylin may be represented by the formula—



Emodin from Aloe and Rhamnus Frangula. O. A. Oesterle. (*Archiv. der Pharm.*, ccxxxvii. 699–704.) Emodin extracted from frangula bark crystallises in orange-red needles and melts at 250°. It can also be distinguished from aloe-emodin by heating it for a little while with strong sulphuric acid, bringing a few drops of the mixture into water, and making alkaline with ammonia, when a cherry-red solution is formed, which gives an absorption band between 0·56 and 0·47μ. Under similar circumstances, aloe-emodin yields a distinctly violet solution, with an absorption band between 0·59 and 0·49μ.

When heated with propionic anhydride, aloe-emodin yields a yellow *product* melting at 152–153°; the *product* from frangula-emodin melts at 121–122°. When treated with benzoyl chloride and sodium hydrate, aloe-emodin yields a *tribenzoyl* derivative, whilst frangula-emodin gives a *dibenzoyl* derivative; these are yellow, and melt at 235° and 225° respectively.

Cerin and Friedelin. C. I. Istrati and A. Ostrogovich. *Comptes Rendus*, 1899, 1581–1584.) The authors give a descrip-

tion of cerin, $C_{27}H_{44}O_2$, and friedelin, $C_{43}H_{70}O_2$, two crystalline products obtained from cork by extraction with chloroform and fractional crystallisation of the extract. For details reference should be made to the original paper.

Pectins. E. Bourquelot. (*Comptes Rendus*, 1899, 1241–1244, and *Journ. de Pharm.* [6], vi. 281–286. From *Journ. Chem. Soc.*) Pectins are substances which dissolve in water, forming viscid solutions which resemble those of the gums and mucilages in yielding mucic acid by oxidation with nitric acid, and differ from them in being coagulated by barium and calcium hydrates and the soluble ferment pectase; moreover, the pectins yield pectic acid on treatment with potash. The author has isolated pectins from the quince, from *Cynorrhodon*, and from gooseberries by extracting the vegetable matter with alcohol, digesting with water at 108–110°, and precipitating the pectin from the aqueous solution by alcohol. The different pectins thus obtained, and that from gentian root are, contrary to Fremy's observation, optically active; they are all dextrorotatory, the value of $[\alpha]_D$ varying from 82·3° to 194°. They yield arabinose on hydrolysis with dilute sulphuric acid, and mucic acid on oxidation with nitric acid; it appears probable, therefore, that they are derived in part from araban and galactan, although only in the case of the pectin from gentian has a product resembling galactose been obtained on hydrolysis.

Germinated barley contains a soluble ferment capable of hydrolysing pectins, and as this is absent in the saliva and in the juice of *Aspergillus niger*, it cannot be amylase which occurs in these fluids; in all probability, it is a new ferment, and the name *pectinase* is suggested for it. When pectinase is added to a solution of pectin, the latter is no longer coagulable by pectase and a reducing sugar is produced; moreover, the ferment has the power of dissolving the coagulum produced by pectase, the action being one of hydrolysis. On adding the two ferments simultaneously to a solution of pectin, a coagulum appears and afterwards redissolves if the pectase is in excess; if, however, the pectinase predominates, the solution remains clear. The effects of pectase and pectinase on pectins are quite comparable with those of rennet and trypsin on casein; in each case, the former ferment coagulates whilst the latter redissolves the coagulum.

Purified Gelatin. C. T. Mörner. (*Zeitschr. physiol. Chem.*, xxviii. 471–523.) By treating gelatin in succession with water, dilute potash, dilute acetic acid, water, alcohol, and warm water, filtering, precipitating with alcohol, drying, powdering, extracting

with ether, etc., a product was obtained containing only from 0·25 to 0·75 per cent. of ash. It contains 0·2 per cent. of sulphur; this is present in the gelatin, not in impurities; the higher percentage of sulphur given by others is due to proteid admixture. With Millon's reagent, it gives a reaction which, however, is transitory unless the reagent is considerably diluted with water. With sodium chloride, potassium ferrocyanide, and acetic acid, it gives a precipitate when these reagents are present in suitable proportions. The idea that gelatinisation depends on the presence of mineral constituents was not confirmed; neither was any support found for what Dastre calls the "salt-digestion" of gelatin.

Nitrocellulose. G. Lunge and E. Weintraub. (*Zeitschr. angew. Chem.*, 1899, 441–448 and 467–475. From *Journ. Chem. Soc.*) By the action of concentrated nitric acid on a solution of cellulose in concentrated sulphuric acid, a substance is obtained which is soluble in acetone, ethyl acetate, methyl and ethyl alcohols, and in concentrated nitric acid. This compound contains nitrogen corresponding in amount with that required for a pentanitrocellulose, and is possibly a pentanitrocellulose-dextrin or a pentanitramyloid. By increasing the proportion of sulphuric acid to nitric acid in the ordinary process of nitration, the velocity of the reaction is very greatly decreased, and the product contains less nitrogen; when the ratio of the sulphuric acid to the nitric acid is 8 to 1 or more, some of the cellulose is not attacked. Nitration takes place much more rapidly at higher temperatures, but there is a greater loss of material by solution in the acid; the nitrocellulose obtained by nitrating at 40° contains less nitrogen than that prepared at the ordinary temperature. The presence of nitric peroxide in the nitric acid used for nitration has apparently little or no effect until its amount reaches 12 per cent., when the degree of nitration effected is slightly diminished. The highest nitrated products, when examined under the microscope in polarised light, have a characteristic light or dark blue appearance, but it is impossible to distinguish hexanitrocellulose from pentanitrocellulose. As the percentage of nitrogen decreases, the blue gradually fades into grey. The presence of cellulose in the product is easily detected by the brilliant yellow to reddish coloration, but the intensity of the coloration does not afford a trustworthy indication of the quantity present. To determine the amount of free cellulose, about 5 grammes of the nitrocellulose are heated at 40–50° for 20–30 minutes with 150 c.c. of a mixture of 100 c.c. of acetone with 100 c.c. of ordinary alcohol in which 2–3 grammes of sodium

have been dissolved. The nitrocellulose is destroyed by sodium methoxide or ethoxide, and also, but more slowly, by sodium amyloxide. The brown, insoluble residue is washed with alcohol and water by decantation, collected, and finally washed with hot water containing a little hydrochloric acid; it still contains traces of nitrocellulose, which may be removed by repeating the process. The cellulose obtained is colourless when wet, but very slightly yellow when dry; the colour may be removed by means of bleaching powder.

Occurrence of Cholesterol in the Products of Beet Sugar Manufacture. E. O. von Lippmann. (*Ber. der deutsch. chem. Ges.*, xxxii. 1210–1212.) A substance differing entirely from phytosterol, and proved to be identical with ordinary cholesterol, has been isolated by the author from the scum formed on a waste liquor from the treatment of crude beet sugar.

Oxidation Products of Cholic Acid. M. Lassar-Cohn. (*Ber. der deutsch. chem. Ges.*, xxxii. 683–687.) Cholic acid in alkaline solution, kept saturated with carbonic anhydride, is oxidised to dehydrocholic acid by permanganate at the ordinary temperature. This process, however, gives but a poor yield.

Bilianic acid, $C_{21}H_{31}O_2(COOH)_3$, is best obtained by dissolving cholic acid, freed from alcohol, in aqueous sodium carbonate, pouring the solution into 2 per cent. potassium permanganate, decolorising after two days with sodium hydrogen sulphite and sulphuric acid, and filtering after a further twenty-four hours; the yield is 53 per cent. The crude product contains about 2 per cent. of isobilianic acid; to remove this, it is treated with boiling baryta water; barium isobilianate is insoluble, the bilianate soluble, in hot water. The acids are recrystallised by dissolving them in a little alcohol and diluting the solution with water.

Cilianic acid, $C_{17}H_{25}O_3(COOH)_3 + H_2O$, is obtained by dissolving bilianic acid in 12 per cent. caustic soda, adding a dilute solution of potassium permanganate, and boiling vigorously in a flask for twenty minutes or so, until decolorisation is complete. The product of ten such operations was mixed with sodium hydrogen sulphite, and 20 per cent. sulphuric acid, until it was decolorised and acid in reaction; from this solution, the cilianic acid separated in the course of twenty-four hours; it was recrystallised from alcohol and water. It melts at 242°, forms a silver salt of apparently abnormal composition, and has about half the normal molecular weight in freezing acetic acid and boiling ethereal solution; this is perhaps due to the fact that it contains 1 H_2O which

cannot be removed by drying, but is possibly split off in solution. The *trimethylic* salt, prepared from the silver salt and methyl iodide, melts at 119°, and has the normal molecular weight in freezing phenol solution.

Action of Alkalies on Maltose, Lactose, and Melibiose. C. A. L. de Bruyn and W. A. van Ekenstein. (*Rec. Trav. Chim.*, xviii. 147–149.) When a 20 per cent. aqueous solution of maltose is heated with one-fifth its volume of normal caustic potash for three hours at 100°, dextrose is initially formed, but undergoes conversion into mannose, which can be isolated in the form of its phenylhydrazone. On fermenting the solution, a residue remains which has a dextrorotatory power nearly one-half that of dextrose; this residue, which is converted into dextrose by the action of dilute acid, and thus rendered fermentable, appears to consist of an anhydride of dextrose.

Lactose, on treatment with alkali, yields galactose, which can be isolated in the form of its phenylmethylhydrazone; a small quantity of ψ-tagatose is also formed, but neither dextrose nor mannose can be isolated; dextrose, if formed, appears to exist as anhydride. Lead hydrate converts lactose into the same products as caustic potash.

Melibiose, under the influence of potash or lead hydrate, yields galactose; the formation of dextrose could not be proved.

Fischer has shown that the aldehyde-group of lactose is in that portion of the molecule which, on inversion, yields dextrose; the authors' experiments indicate, on the contrary, that this group is in the portion which gives rise to galactose. The apparent contradiction awaits explanation.

Composition and Characters of Honey. C. Hoitsema. (*Zeitschr. für analyt. Chem.*, xxxviii. 439–441. From *Journ. Chem. Soc.*) The following estimations were made in ten samples of honey of known origin:—(1) Specific gravity at 15° of a filtered solution of 1 part of honey in 2 parts of water; (2) pollen and wax, the constituents insoluble in warm water; (3) moisture estimated by drying without heat in a vacuum desiccator; (4) optical rotation; (5) ash; (6) reducing and invertible sugars. The sp. gr. ranged from 1·102 to 1·14, water from 8·3 to 17·8 per cent.; polarisation from $-3·1$ to $-9·1$, being in all cases negative, ash, 0·12 to 0·34 per cent.; pollen and wax, 0·02 to 0·46 per cent.; reducing sugar, 71·2 to 74·4; and sucrose, 0·2 to 2·6 per cent., whilst a sample of unknown origin showed 6·4 per cent. of the latter.

Oxidation of Organic Compounds with Alkaline Permanganate. E. Donath and H. Ditz. (*Journ. prakt. Chem.*, 1899, 566–576.) While the final products obtained on heating organic compounds with strong acid permanganate solution are usually carbon dioxide and water, the oxidation with alkaline permanganate results in the formation of oxalic acid. The formation of formic acid, referred to by Berthelot, as one of the products in the latter oxidation, is doubted by the authors on the ground that this acid is itself readily attacked and decomposed by alkaline permanganate. Propylene, isobutylene, and amylene, ethyl alcohol, acetone, fatty acids, butyric, lactic, succinic, and tartaric acids, lactose, dextrose, sucrose, all yield oxalic acid. Alkaline permanganate may be employed for estimating glycerin in fats, acetone in wood naphtha, and also for the estimation of lactic acid. Benzol and toluol are not oxidised by alkaline permanganate. Sulphur compounds, such as carbon bisulphide, thiophen, etc., are readily decomposed; hence benzol can be easily freed from thiophen by means of alkaline permanganate.

The Oxidation of Certain Organic Acids in Presence of Ferrous Salts. H. J. H. Fenton and H. O. Jones. (*Proc. Chem. Soc.*, xv. No. 215.) The oxidation of various organic substances in presence of iron has formed the subject of a considerable number of previous communications, and the observations are now being extended in several directions. The present paper deals with results which have recently been obtained in an extensive study of the behaviour of acids of typical constitution when oxidised by hydrogen peroxide in presence of ferrous salts.

It is shown that, under the conditions of the experiments, the following acids are unacted upon by the reagent: acetic, monochloracetic, oxalic, malonic, succinic, dibromosuccinic, fumaric, maleic; whereas an energetic, and generally immediate, oxidation occurs in the case of the following acids: formic, glycollic, lactic, β-oxybutyric, glyceric, tartronic, tartaric, malic, citric, mucic, saccharic, pyruvic, dioxytartaric, acetylene dicarboxylic, acetone dicarboxylic, pyromucic, benzoic and picric acids.

The oxidation products obtained are often of considerable interest, and changes can be effected which have not been accomplished by any other means. These oxidation products are being examined, and in the present communication an account is given of the progress of the investigation.

Conversion of Citric Acid into Oxalic Acid by Oxidation with Potassium Permanganate. G. Denigès. (*Journ. de Pharm.*,

[6], xi. 102.) When citric acid is oxidised with potassium permanganate, the oxalic acid found amongst the oxidation products gradually separates out as crystalline manganese oxalate. Some of the crystals are prismatic and of a rose colour, and correspond with the formula $Mn C_2 O_4 + 3 H_2 O$; the others are white, hexagonal crystals, and contain only $2 H_2 O$.

Stability of Solutions of Oxalic Acid. W. P. Jorissen. (*Zeitschr. für angew. Chem.*, 1899, 521–525. From *Journ. Chem. Soc.*) A sterilised normal solution of oxalic acid suffered no decomposition in the dark, even after 101 days, but when exposed to the light it lost, in 57 days, so much acid that its strength was reduced from *N* 0·99 to *N* 0·965; after 101 days' exposure, this was reduced to *N* 0·926. A solution containing 10 grammes of oxalic acid and 50 c.c. of sulphuric acid per litre also kept well in the dark, but exposure to light for 37 days reduced its strength from 0·1592 to 0·1420. A solution containing 10 grammes of oxalic and 1 gramme of boric acid per litre did not suffer any diminution of strength in the dark, but in the light its strength was reduced from 0·1592 to 0·1523 in 37 days. A centinormal solution of oxalic acid containing also 1 gramme of boric acid per litre did not lose in strength in the dark, but when exposed to the light its acidity was reduced from 0·01002 to 0·002, and after 78 days to *nil*.

A centinormal solution of oxalic acid mixed with mould (which had been cultivated on moist bread) was reduced in strength from 0·00992 to 0·00927 when kept in the dark for 62 days; in a second experiment, the acid completely disappeared when kept in the dark for 56 days. The mould has, however, no appreciable action on decinormal or centinormal solutions when these contain in addition 50 c.c. of sulphuric acid per litre. A centinormal solution containing 1 gramme of boric acid per litre and mixed with the mould was reduced in strength from 0·01002 to 0·00711 when kept in the dark, in winter time, for 62 days; from 0·0100 to 0·00926 at the summer temperature in 56 days. When 2 grammes of boric acid were used, there was no loss when kept for 62 days in winter time, but 44 days' exposure in summer time reduced the strength from 0·01010 to 0·00916. Addition of alcohol was also tried, a decinormal solution of oxalic acid in water containing 12·4 per cent. of alcohol being exposed for 36 days in the dark, when the strength had diminished from 0·0984 to 0·0931; when exposed to the light, it diminished from 0·0984 to 0·0716; addition of twice the amount of alcohol gave no better results. The action in the dark is probably due to the formation of ethyl oxalate.

Further experiments are appended showing that sulphuric and boric acids increase the velocity of oxidation of oxalic acid in the light. A remarkable action is exercised by magnanous sulphate, for this salt, whilst acting as a preservative in the light, actually promotes the oxidation of the acid in the dark.

Note on Glacial Acetic Acid. F. H. Alcock. (*Pharm. Journ.*, 4th series, ix. 201.) The author points out that the requirement, that glacial acetic acid should dissolve an equal volume of oil of turpentine, would form a useful addition to the official characters and tests of this acid.

Occurrence of Acetaldehyde in Petroleum Products. C. J. Robinson. (*Journ. Soc. Chem. Ind.*, xviii. 232.) While examining the distillates obtained from crude petroleum, it was found that acetaldehyde is present in the light naphtha first obtained, but is practically absent from the heavier products immediately following, and that it again appears and reaches a maximum when the temperature of the still is high enough to produce "cracking." The amount in crude petroleum may be roughly estimated by agitating the sample with water, or, better still, by first distilling off the naphtha and treating this with water; the amount obtained was about 0·001 per cent.

Solanthic Acid. W. Bräutigam. (*Pharm. Zeit.*, xliv. 638.) *Solanthic acid*, $C_9H_{10}O_{10}$, melts at 144°, sublimes without decomposition, is soluble in alcohol, ether, and water, and readily crystallises from its aqueous solution. It is prepared from the flowers and stems of *Helianthus annuus*, in which it exists in combination with calcium.

Filicic Acid. R. Boehm. (*Liebig's Annalen*, cccvii. 249-282; *Journ. Chem. Soc.*, 1899, i. 804–805.) The author represents the constitution of filicic acid by one of the formulæ,

$$CMe_2\begin{cases}C(OH):CH\\C(OH):CH\end{cases}CO, \text{ and } CMe_2\begin{cases}C(OH):CH\\CO\text{——}CH\end{cases}C\cdot OH,$$

which illustrate the close relation between this compound and phloroglucinol; tetrabromofilicic acid has the constitution expressed by the formula, $CMe_2\begin{cases}CO\cdot CBr_2\\CO\cdot CBr_2\end{cases}CO$.

Filicic acid crystallises from alcohol in small, colourless cubes, and melts at 213–215°, when it becomes brown; the aqueous solution develops a red coloration with ferric chloride, and reduces potassium permanganate and an ammoniacal silver solution. On adding a colourless specimen of aniline to the alcoholic solution, a beautiful, reddish-violet coloration is slowly developed; when the

crystalline acid is heated with aniline and acetic anhydride or glacial acetic acid, an emerald green coloration is gradually produced. The *methyl ether*, $C_8H_9O_2 \cdot OMe$, prepared by saturating a hot solution of filicic acid in methylic alcohol with hydrogen chloride, crystallises from ethylic acetate in colourless, lustrous prisms, and melts at 208°; it dissolves with difficulty in boiling water, and develops a violet red coloration with ferric chloride. The *ethyl ether* crystallises from alcohol in lustrous prisms, and melts at 215°; the *diethyl ether*, $C_8H_8O(OEt)_2$, prepared by heating it with ethylic iodide and alcoholic potash, crystallises from light petroleum in quadratic plates or long prisms melting at 103–105°, and is indifferent towards ferric chloride. The *diacetyl* derivative, $C_8H_8O(OAc)_2$, crystallises from alcohol in large, six-sided plates and melts at 82–85°; it is indifferent towards ferric chloride. When the potassium salt of filicic acid is oxidised with potassium permanganate, 35 per cent. of dimethylmalonic acid is produced.

A dichloride and several bromo- and chloro-derivatives of filicic acid are also described in this paper.

Oleic Acid. W. Fahrion. (*Chem. Zeit.*, xxiii. 770.) A specimen of pure oleic acid, which had been kept in a glass bottle for three years, contained a substance insoluble in alkali. This was extracted by shaking the neutral aqueous alcoholic solution with light petroleum. The amount of this neutral substance was about 5·53–5·67 per cent., its iodine number 53·3–54·8; it appeared, however, to be a mixture of a crystalline substance and an oil, the latter having the same percentage composition as oleic acid.

Rancidity of Fats. A. Scala. (*Bied. Centr.*, xxviii. 196–198. From *Journ. Chem. Soc.*) Olive oil, pig's fat, and butter, when rancid, showed greatly diminished iodine numbers, and contained less non-volatile fatty acids than when fresh, whilst the refractive index, the volatile fatty acids, and the ether numbers increased.

Further experiments with olive oil, pig's fat and tallow showed that, when exposed to air and light, olive oil gained 9 per cent., pig's fat 3·5 per cent., whilst tallow (with an iodine number of only 25) gained only 1·5 per cent., oleic acid gained 8·35 per cent., whilst stearic and palmitic acids lost slightly in weight.

It is therefore concluded that rancidity depends alone on the oxidation of oleic and other acids of that series. Very rancid olive oil yielded œnanthaldehyde when distilled with steam. Hydrolysis produced formic, acetic, butyric, and œnanthic acids; also

some non-volatile acids, $C_n H_{2n-2} O$, including azelaic and sebacic acids.

In rancid oleic acid, the same compounds were detected, and, in addition, a solid substance (dihydroxystearic acid) which causes opacity and viscosity. The increase of density observed in rancid fats is partly due to the production of solids.

Cacao Butter and its Adulterants. A. Ruffin. (*Ann. de Chim. Analyt.*, iv. 344; *Pharm. Journ.*, 4th series, ix. 445.) Cacao butter has, according to the author, the following constants:—Sp. gr. 0·910, refraction index, 34. Saponification number, 179–180. Iodine number, 48. Melting point, 30° C. Titre of fatty acids, 23°. The addition of vegetable fats will increase the density, and the iodine number, while the other constants will be lowered. Animal fats, on the other hand, raise the melting point and the fatty acid figure, while the refraction index is lowered. Coco-nut fat, however, considerably increases the saponification number and the refraction index, while the other constants are lowered. On etherification of the fatty acids obtained in the presence of alcohol and of sulphuric acid, the characteristic odour of coccinic ether will confirm the presence of coco-nut fat.

Gossypol, a Constituent of Cotton-Seeds. L. Marchlewski. (*Journ. für prakt. Chem.*, lx. 84–90.) When the phenolic constituents of cotton-seed oil are purified by repeated fractionation from acetic acid solution, a crystalline product is obtained which can be further purified by crystallisation from a mixture of alcohol and dilute acetic acid; this substance, to which the name of *gossypol* is given, has a composition corresponding to the formula $C_{13} H_{14} O_4$. It is a finely crystalline, yellow substance, which dissolves readily in alcohol, ether, benzol, and in alkalies, but is insoluble in water. Concentrated sulphuric acid imparts to it a cherry-red colour, and hence it is concluded that the red colour produced when crude cotton-seed oil is treated with sulphuric acid is due to gossypol.

Euphorbone. A. Orlow. (*Pharm. Journ.*, 4th series, ix. 621, from *Chem. Zeit. Rep.*, xxiii. 174.) The author has extracted this body from euphorbium by means of petroleum ether. He attributes to it the formula $C_{15} H_{24} O$. It melts at 114–115° C. By crystallisation from ice-cold alcohol crystals are obtained, which melt at 91° C. Those obtained from petroleum ether melt at 67° C.; by re-crystallisation of those from alcohol the melting point is raised to 114° C. The crystals retain one molecule of alco-

hol. Heated with water, the sparingly soluble euphorbone yields a substance giving a dark colour with ferric chloride, which is not destroyed by hydrochloric acid: but in an alcoholic solution the colour obtained is discharged. Dried chlorine reacts with euphorbone in chloroformic solution, yielding an amorphous chloro-compound, which yields up chlorine on fusing with alkali. By heating with iodine an amorphous body is obtained, from which the iodine can be recovered by treatment with silver oxide; the residue, however, is not euphorbone. By treatment of the alcoholic or chloroformic solution of euphorbone with a chloroformic solution of bromine, an orange-coloured precipitate is obtained, which is only with difficulty soluble in absolute alcohol. The formula is $C_{15}H_2H_{21}Br_3O$. By heating with alcoholic potash, this bromo-euphorbone is not changed, but it is decomposed by strong nitric acid. The iodine compound does not resemble this. After treating euphorbone with fuming nitric acid, the addition of water throws down a nitrogen containing acid, which is yellow, and dissolves in alkali to a red colour. By treatment with zinc dust in acetic acid and alcohol, a body soluble in water is formed, which is very similar to an amide.

Aldehyde-Musk. A. Baur-Thurgau and A. Bischler. (*Ber. der deutsch. chem. Ges.*, 3647–3648.) Butylxylylaldehyde is best prepared by heating the corresponding glyoxylic acid with *p*-toluidine and treating the product with sulphuric acid: it crystallises in large tablets, melting at 60°, and readily yields an *oxime*, which forms white plates melting at 97–98°. Nitric acid of 95 per cent. converts the aldehyde into a *mononitro*-compound, which crystallises in yellow, odourless plates melting at 66°. Nitric acid of 100 per cent., on the other hand, yields the *dinitro*-compound, $C_{13}H_{16}O_5N_2$ (aldehyde-musk), crystallising in faintly yellow tablets melting at 112°. This product readily forms condensation products with various compounds; the derivative, $C_{14}H_{17}O_6N_3$, obtained from nitromethane, melts at 206°. Acetic anhydride converts aldehyde-musk into a *diacetyl* derivative, $C_{17}H_{26}O_6N_2$, melting at 147°, which can also be obtained by converting butylxylylaldehyde into the *diacetyl* derivative melting at 87°, and treating this with nitric acid.

Action of Certain Gases on Caoutchouc. A. d'Arsonval. (*Comptes Rendus*, 1899, 1545–1546.) Caoutchouc, when kept in carbonic anhydride under pressure, absorbs large quantities of the gas, and swells to many times its original volume. The caoutchouc thus treated is less elastic and more gelatinous than

before, and when exposed to the air gives off bubbles of carbonic anhydride with a slight cracking noise.

At an ordinary pressure, carbonic anhydride escapes readily through a caoutchouc bag, and still more rapidly when the pressure is increased. With oxygen the escape is less rapid, and still less so with nitrogen.

A New Constituent of Tobacco Smoke. H. Thoms. (*Pharm. Journ.*, 4th series, x. 69, from *Pharm. Centralh.* xl. 706.) The author has detected in tobacco smoke a very poisonous oily substance which produces violent headache, trembling, and giddiness. The chief part of this oil boils between 220–230° C. By treatment with 2 per cent. potash solution, a phenol-like body may be separated which has an odour resembling creosote, and which boils at 190–200° C. To the presence of this oil, the observed toxic effects of tobacco may be attributed, since it is known that those are not altogether dependent on the proportion of nicotine in the tobacco.

Purification of Coal Tar. (*Pharm. Centralh.*, xxxix. 933.) Coal tar, intended for pharmaceutical purposes, may be readily purified by dissolving it in 3 parts of acetone or benzol, filtering and distilling off the solvent. The product is a brownish-black, thick liquid, which mixes readily with vaselin, lanolin, etc.

Wood-Tar Creosote. L. F. Kebler. (*Amer. Journ. Pharm.*, 1899, 356, and 409–414.) The author finds that commercial creosote is almost entirely devoid of guaiacol, the percentage varying from 0 to 16. He is also of opinion that no creosote ever contained so much as 60 per cent. of guaiacol, thus bearing out the results of the work of Béhal and Choay, who found that the fraction obtained by distilling crude wood-tar creosote between 200° and 210° C., contained at most only about 25 per cent. of guaiacol. The author suggests that the B. P. boiling point range (200° to 220° C.) should be adopted in the U. S. P. The specific gravity should not be below 1·08 at 15° C. The amount of guaiacol may be determined as follows: 5 c.c. of creosote are mixed with 50 c.c. of a 20 per cent. alcoholic solution of potassium hydrate. The crystalline mass, which separates in 10–30 minutes, consists of a compound of guaiacol and creosol with potassium. The dried crystals are heated for a moment with 5 c.c. of a 10 per cent. solution of sulphuric acid, the liquid is diluted, and the mixture of guaiacol and creosol, which separates as a heavy oil, removed. By treating this oil with 4 c.c. of a concentrated solution of ammonia, the guaiacol ammonium compound is formed as a crystalline mass,

which separates before the less crystalline creosol compound. The latter is removed by means of benzol, and the guaiacol ammonium compound decomposed by a 10 per cent. solution of sulphuric acid. The liberated guaiacol is dissolved by shaking with benzol, and finally weighed after evaporating the solvent.

In order to differentiate between creosote and phenols, 1 volume of the creosote is thoroughly agitated with diluted glycerin (3 parts of glycerin to 1 of water), and the mixture set aside for separation. The diminution in the volume of creosote indicates roughly the amount of soluble impurities.

Resin Oil. G. Kraemer and A. Spilker. (*Ber. der deutsch. chem. Ges.*, 1899, 3614.) The oil obtained by distilling colophony under pressure (*Ber. der deutsch. chem. Ges.*, 1899, 2952), to which the authors assigned the formula $C_{42}H_{62}$, appears, from a determination of its molecular weight by the cryoscopic method, to have the composition $C_{18}H_{28}$, and is perhaps derived from abietic acid by the loss of 1 mol. of carbon dioxide.

Eudesmol. H. G. Smith. (*Pharm. Journ.*, 4th series, ix. 315.) The author deals with the chemistry of eudesmol, a crystalline stearoptene previously discovered by himself and R. T. Baker in eucalyptus oil. It is found in the oil of many species of *Eucalyptus*, and should, it is stated, be present at certain times of the year in all eucalyptus oils which are eventually rich in eucalyptol. The formula assigned to eudesmol—$C_{10}H_{16}O$—shows that the compound is isomeric with ordinary camphor, but it has the oxygen atom combined in a different manner. It does not appear to be ketonic, and it cannot be reduced by sodium in alcohol or by other methods. It is optically inactive, forms a dinitro-compound and a dibromide, but does not form a nitrosochloride. Eudesmol melts at 79–80° when perfectly pure, but has a tendency to form products having a lower melting point. On oxidation with dilute nitric acid, camphoronic acid is formed, but no camphoric acid. A large amount of evidence was brought forward to show that eudesmol is intermediate in the formation of eucalyptol, and that eucalyptol is derived directly from the fraction containing eudesmol if the oil be kept in the crude condition for some time under ascertained conditions. Oxygen is necessary to this alteration. It is suggested that the oxygen atom enters the eucalyptol molecule during the formation of eudesmol, and that by the natural alteration of the high boiling fraction of oils containing eudesmol (*E. macrorhyncha*, for instance) eucalyptol is formed. The oil of *Eucalyptus camphora* was found to be rich in eudesmol at the

time of year when distilled. It was shown that the oils from certain groups of eucalypts are dextrorotatory when their maximum eucalyptol content is reached, and that they do not at that time contain phellandrene, although at certain times of the year phellandrene may be present. Since camphoronic acid is probably trimethyl tricarballylic acid, and as eucalyptol is derived from eudesmol which in turn forms camphoronic acid, the question is raised whether Brühl's formula for eucalyptol is correct. It is suggested that the oxygen atom in eudesmol is quadrivalent, and that the peculiarity of eucalyptol may be thus accounted for. From the formula suggested for eudesmol, camphoronic acid, as trimethyl tricarballylic acid, can be constructed.

The Terpene from Solid Pinene Dibromide. M. Godlewski and G. Wagner. (*Journ. Chem. Soc.*, 1899, 618.) When Wallach's pinene dibromide (m. p. 169–170°) is treated with zinc dust and acid, the *terpene* $C_{10}H_{16}$ is produced; it melts at 65–66°, and boils at 153°. The hydrocarbon is indifferent towards potassium permanganate, but yields a solid additive compound with hydrogen chloride. If the new terpene does not contain an ethylenic linking, it represents a new type of hydrocarbon, to which the authors give the name *tricyclene*; such a substance would be the analogue of anthracene and phenanthrene.

Occurrence of Isopulegol in Commercial Citronellal. F. Tiemann. (*Ber. der deutsch. chem. Ges.*, xxxii. 825–826.) When citronellal in commercial samples is separated from the accompanying terpenes by conversion into stable sodium citronellal-hydrosulphonate, a residue is obtained which has the odour, boiling point, and refractive index of isopulegol, but which probably contains, also, small quantities of geraniol and citronellol. The presence of isopulegol in the mixture was proved by oxidising it with chromic acid mixture, and converting the resulting isopulegone into the characteristic mixture of semicarbazones which melted at 173°, and was separable into two portions having the properties described above.

Separation of Citral from Citronellal; and the Composition of Oil of Lemon Grass. F. Tiemann. (*Ber. der deutsch. chem. Ges.*, xxxii. 812–823; *Journ. Chem. Soc.*, 1899, 622.) J. Flatau and H. Labbé have proposed a method of separation in which a solution of the sodium hydrogen sulphite compounds of the two aldehydes is treated with barium chloride; the barium hydrogen sulphite derivative of citronellal is said to be precipitated, whilst the citral remains in solution. The author finds that the citronellal is not

completely precipitated, and that the precipitate contains citral; moreover, neither aldehyde can be regenerated from the solution or precipitate without considerable loss.

As the best method for separating citral from citronellal, available also in the presence of methylheptenone, terpene alcohols and terpenes, the following is recommended:—The oil is first shaken with a solution containing 100 grammes of crystallised sodium sulphite and 35 grammes of sodium bicarbonate in 1 litre of water; this dissolves the citral, which can be liberated from the solution by means of caustic soda. The oil is next shaken with a solution of 350 grammes of crystallised sodium sulphite and 62·5 grammes of sodium bicarbonate in 1 litre of water; a precipitate is formed of the sodium hydrogen sulphite compound of citronellal, from which the citronellal can be liberated by means of sodium carbonate. The residual oil, extracted with ether from the crystals and aqueous solution, is shaken with a solution of 1 part of commercial solid sodium hydrogen sulphite in $1\frac{1}{2}$ parts of water, the solution being cooled with ice; in these circumstances, the sodium hydrogen sulphite compound of methylheptenone is precipitated; this yields methylheptenone when treated with sodium carbonate.

It is found that oil of lemon grass contains 0·2 and oil of lemons 0·4 per cent. of citronellal. The citral contained in oil of lemon grass amounts to 73–82 per cent. After citral, citronellal and methylheptenone have been isolated in the manner above described, the residual oil contains 5–6 per cent. of terpenes (limonene, dipentene, sesquiterpenes, etc.), and also terpene alcohols (geraniol, and probably *l*-linalool and *l*-terpineol). By treatment with alcoholic potash, followed by distillation with steam and fractionation of the oil that distils over, methylheptenone and crude geraniol were obtained. Geraniol can also be obtained directly from oil of lemon grass by treatment with benzoic anhydride and hydrolysis of the benzoates formed.

Tuberone, the Aromatic Principle of the Tuberose Flower. A. Verley. (*Bull. Soc. Chim.*, xxi. 306–309. From *Journ. Chem. Soc.*) By distilling in a vacuum a concentrated extract of tuberose, a small quantity of a pure product, boiling at 167° under 15 mm. pressure, is obtained. This substance, which the author calls *tuberone*, possesses in a high degree the odour of the tuberose, which slightly resembles that of coumarin, but is much more fragrant and persistent. It has a sp. gr. of 0·9707 at 8°, and a refractive index n_D 1·516 at 14°; it has the formula $C_{13}H_{20}O$, which is the same as that of irone obtained from the root of the iris, and

is an unsaturated compound, as it decolorises aqueous permanganate, whilst its behaviour with bromine shows that the molecule contains one double linking; probably the constitution may be expressed by the formula,

$$\begin{array}{l} CH_2\cdot CH_2\cdot CH\cdot CO\cdot\ CH_2 \\ \quad|\qquad\quad|\qquad\quad| \\ CH_2\cdot CH_2\cdot CH\cdot CH_2\cdot CH\cdot CH_2\cdot CH{:}CH_2\cdot \end{array}$$

Acetic anhydride has no action on tuberone even on boiling for several hours, but heating with phenylhydrazine causes the elimination of water, indicating the presence of a carbonyl group in the molecule. On heating tuberone with aqueous chromic acid in a reflux apparatus, formaldehyde is produced together with an oily acid which, however, was obtained in quantity insufficient for analysis.

Oxidation of Camphor by means of Ferricyanides. A. Étard. (*Comptes Rendus*, cxxx. 570.) When camphor is treated with potassium or sodium ferricyanide at the ordinary temperature, it is converted into camphoric acid.

Constitution of Camphoric Acid. L. Balbiano. (*Ber. der deutsch. chem. Ges.*, 1899, 1017–1023.) The oxidation of camphoric acid by means of cold alkaline potassium permanganate to the acid $C_8H_{12}O_5$ and oxalic acid is most readily explained by means of Bredt's formula:

$$CMe_2\begin{array}{l}<CH(COOH)-CH_2\\ \quad\ CMe(COOH)\cdot CH_2\end{array} \rightarrow CMe_2\begin{array}{l}<CH(COOH)-\\ \quad\ CMe(COOH)\end{array}>O.$$

If the Perkin-Bouveault formula be used, it is necessary to assume the intermediate formation of trimethylglutaric acid; the author now shows that this acid does not appear among the oxidation products, and that it is not oxidised by alkaline permanganate to the acid $C_8H_{12}O_5$; the only oxidation product appears to be a little dimethylsuccinic acid, and the greater part of the acid is not attacked. Perkin's formula does not allow of the formation of the acid $C_8H_{12}O_5$.

Hydrocyanic Acid in Vicia Seeds. F. F. Bruyning and J. van Haarst. (*Rec. Trav. Chim.*, xviii. 468–471. From *Journ. Chem. Soc.*) Flour from the following species and varieties of *Vicia* contains hydrocyanic acid: *V. sativa*, *V. sativa* v. *dura*, *V. sativa* v. *flore alb.*, *V. sativa* v. *Bernayer*, *V. sativa* v. *Britannica*, *V. canadensis*, *V. hirsuta*, and *V. angustifolia*; these hence contain amygdalin or analogous substances. No hydrocyanic acid

was detected in: *V. narbonensis*, *V. cracca*, *V. agrigentina*, *V. biennis*, *V. disperma*, *V. pannonica*, and *V. cassubica*.

The Presence of Vanadium, Molybdenum, and Chromium in Plants. E. Demarçay. (*Comptes Rendus*, cxxx. 91–92.) Vanadium, molybdenum, and chromium have been detected by the author in the ashes of various woods by chemical and spectroscopic examination.

Lithium in Plants. E. Tschermak. (*Chem. Centr.*, 1899, 1127.) The author's results indicate that lithium occurs in plants to a far greater extent than was supposed. In accordance with Focke's observations, lithium is found only in the leaves, the finer portions of the stems, the flowers, and fruit. A list of plants is given in the original paper.

Effect of Arsenic on Algæ. M. Bouilhac. (*Pharm. Journ.*, 4th. series, ix. 357, from *Bull. Soc. Bot. France.*) Some algæ seem to be capable of absorbing a certain amount of arsenic acid in the form of arseniates without injury; these salts partially taking the place of phosphates. Among the algæ which possess this property are *Ulothrix tenerrima*, *Protococcus infusionum*, *Dactylococcus infusionum*, and *Stichococcus bacillaris*. With *Schizothrix lardacea*, arsenic acid appears to have even a more favourable effect on its growth than phosphoric acid.

Injurious Effects of the Presence of Perchlorate in Sodium Nitrate intended for Manuring. M. Maercker. (*Journ. Soc. Chem. Ind.*, xix. 361.) The presence of perchlorate in sodium nitrate used as manure is found to be very injurious to cereals, and to some extent also to other plants. Chlorate is similar in its action. The presence of these impurities is readily recognised by strongly igniting the nitrate in the presence of a little free alkali, and comparing the percentage of chloride found in the residue with that contained in the nitrate before ignition.

Wines obtained from Sterilised Must. A. Rosenstiehl. (*Comptes Rendus*, cxxviii. 1050–1052.) The author has investigated the relative properties of wines prepared from must previously sterilised by heat, and of wines obtained in the ordinary way. The products from heated musts are found to be superior in flavour, deeper in colour, fuller in body, and of greater alcoholic strength than wines obtained from the same grapes in the usual way.

Precipitation of Zymase from Yeast Extract. R. Albert and E. Buchner. (*Ber. der deutsch. chem. Ges.*, xxxiii. 266–271.)

In order to precipitate the zymase from yeast extract, 1 volume of the latter is poured into a mixture of 10 volumes of alcohol and 2 volumes of ether, and the flocculent precipitate thus formed is allowed to dry quickly. With less alcohol the precipitation is incomplete. The active zymase only constitutes a small portion of the precipitate, and re-dissolves rather slowly on stirring with water, having apparently undergone some change under the influence of the alcohol. If the ferment be kept in contact with alcohol for several hours, its activity is lessened to a very marked extent.

Seminase, a New Enzyme. E. Bourquelot and H. Hérissey. (*Comptes Rendus*, cxxx. 340.) The authors apply the name *seminase* to a new hydrolytic enzyme obtained from the seeds of fenugreek and lucerne. They find that this ferment differs from malt diastase in rapidly effecting the hydrolysis of the albumin of the locust bean, which diastase attacks but slowly, whereas seminase, on the other hand, is very much less active on starch paste than diastase.

The Proteid of Locust Beans. E. Bourquelot and H. Hérissey. (*Journ. de Pharm.* [6], x. 153.) The proteid of locust beans (Effront's caroubin) has beeen stated by A. von Ekenstein to yield mannose on hydrolysis. This result is confirmed by the authors, who find that the products of the hydrolysis of this proteid are mannose and galactose.

Synthesis of Tyrosin. E. Erlenmeyer and J. T. Halsey. (*Liebig's Annalen*, cccvii. 138–145. From *Journ. Chem. Soc.*) The *lactimide*, $O\,Ac\cdot C_6H_4\cdot CH:C\begin{cases}N\,Bz\\ |\\ C\,O\end{cases}$, prepared by heating parahydroxybenzaldehyde, hippuric acid, anhydrous sodium acetate, and acetic anhydride during 10–15 minutes on the water-bath, crystallises from dilute alcohol in small, yellow needles, and melts at 172–173°. *Parahydroxy-α-benzamidocinnamic acid*,

$$OH\cdot C_6H_4\cdot C(NHBz):CH\cdot COOH,$$

obtained on hydrolysing the lactimide with hot, aqueous, caustic soda, crystallises from dilute alcohol in white needles, and melts at 228–229°, when it decomposes; reduction with sodium amalgam in alkaline solution gives rise to benzoyltyrosin, which yields tyrosin under the influence of concentrated hydrochloric acid at 150°.

A Soluble Reducing Enzyme in the Animal Organism. E. Abelous and E. Gérard. (*Comptes Rendus*, cxxix. 164–166.)

An aqueous or glycerin extract of the kidney of the horse contains an enzyme which is capable of reducing nitrates to nitrites; if the extract is boiled, the ferment is destroyed, and the liquid no longer reduces nitrates. Antiseptics like chloroform, thymol, essence of cinnamon, and sodium fluoride do not destroy the reducing power of the extract, but mercuric chloride (1 in 2000) does. The amount of nitrite formed attains a maximum at a temperature of 40–45°, above this it gradually decreases and becomes *nil* at 71–72°. A mixture of 100 c.c. of the extract, 8 grammes of potassium nitrate, and 1 c.c. of chloroform was placed in each of three flasks, the air in two of which was displaced by hydrogen and carbonic anhydride respectively. After standing for 24 hours at 42°, the flask, the air in which had been displaced by hydrogen, contained the greatest amount of nitrite, and the flask with the carbonic anhydride by far the least. The addition of sodium carbonate to the extract favours the formation of nitrite. The extract is inactive after filtration through unglazed porcelain.

The enzyme decolorises methylene-blue and seems to reduce butyric acid to butyraldehyde.

Co-Existence of a Reducing and an Oxidising Enzyme in the Animal Organism. E. Abelous and E. Gérard. (*Comptes Rendus*, cxxix. 1023–1025.) The results of the authors' further researches indicate the co-existence of an oxidising, as well as of a reducing, ferment in the animal organism. They have previously shown that when an aqueous extract of the kidney of a horse was allowed to act upon a solution of potassium nitrate, a certain amount of nitrite was formed, which began to diminish in quantity when the action had proceeded for 24 hours at 42° C. (see preceding abstract). This diminution of nitrite is now shown by them to be probably due to the oxidation of the latter by an oxidising enzyme present in the renal extract. By digesting the extract with papain or trypsin, its reducing action is almost entirely destroyed, so that the oxidising action alone takes place. If, on the other hand, the experiment be conducted in an atmosphere of inert gas, such as hydrogen, the absence of air or oxygen renders the oxidising enzyme powerless, while the activity of the reducing ferment remains unchecked.

Action of Heat on Pepsin and Trypsin. V. Harlay. (*Journ. de Pharm.* [6], x. 105–108, and 166–169.) When pepsin, dried at 50°, is heated at 100° for 3½ hours, its digestive action is not changed, but its digestive power is, perhaps, slightly diminished. This confirms the statements of Schmidt and Salkowski. The

activity of an aqueous solution of pepsin is diminished by heating it at 60° for half an hour, and the enzyme is destroyed at about 68°.

The digestive action and power of dry pancreatin are in no way diminished or modified by heating it at 100° for 3½ hours. Its aqueous solution, however, partly loses its digestive power when heated at 55° for 1½ hours, and the enzyme is destroyed at a temperature of about 60°.

Action of Heat on Papain. V. Harlay. (*Journ. de Pharm.* [6], xi. 269.) The author confirms an observation by Würtz that papain, which has been carefully and thoroughly dried, may be heated at 100° C. without any appreciable loss of digestive power. In a solution, however, its proteolytic action is completely destroyed at about 82° C.

Products of the Action of Pepsin and Pancreatic Juice on Fibrin and Albumin. V. Harlay. (*Journ. de Pharm.*, 1899, 225–232, 424–428, and 468–470.) The digestive action of pepsin or pancreatic juice on fibrin has, until now, been regarded as ended when the filtered liquid gives no turbidity with nitric acid; this is shown to be incorrect, as by continuing the digestion beyond this stage, tyrosin crystals were obtained, and the rotatory power of the solution was found to go on diminishing in value. The colour change from red to black produced by the juice of *Russula delica* is characteristic of tyrosin, and is given by the solution obtained by the action of pepsin on fibrin, whereas a red coloration changing to green is produced if the fibrin is digested with pancreatic juice.

The digestive action of pepsin and pancreatic juice on albumin is quite analogous to that on fibrin, except that pancreatic juice acts much more slowly on the former, and digestion is not complete even after the addition of sodium hydrogen carbonate. The juice of *Russula delica* gave a colour change of red to green with the liquid from the pepsin digestion, and of red to black with that from pancreatic digestion. Tyrosin was found in the liquid from the action of the pancreatic juice on albumin.

The green colour produced by the action of the juice of *Russula delica* on the products of the digestive action of pepsin on albumin or fibrin, is changed to a bright red by the addition of a few drops of an alkali, but is restored when acid is afterwards added. On similar treatment, the dark brown liquid resulting from the digestive action of pancreatic juice does not show a colour change.

With liquids resulting from a pancreatic digestion of albumin or fibrin, bromine water produces a precipitate which redissolves when shaken, giving rise to a red liquid, changing to a reddish-

purple on further addition of bromine, a brownish-purple precipitate being finally formed. With liquids resulting from the digestive action of pepsin, only a slight turbidity and a faint, dirty violet coloration are produced, a yellowish precipitate being formed on the addition of excess of bromine.

Action of Food Preservatives on Digestive Ferments. H. Leffmann. (*Amer. Journ. Pharm.*, 1899, 548-549.) The author has investigated the interfering action of certain food preservatives on starch digestion. The experiments were conducted under uniform conditions with a freshly made 10 per cent. decoction of arrowroot. The enzymes employed were malt diastase, taka-diastase, and pancreatic extract. The antiseptics used were saccharin, β-naphthol, formalin, artificial and natural benzoic acids, artificial sodium benzoate, boroglyceride, salicylic acid, boric, citric and tartaric acids, sodium fluoride, sodium silicofluoride, borax, and a mixture of borax and boric acid. From his observations, the author arrives at the conclusion that if the use of any preservatives is to be permitted in food, sodium benzoate and boric acid are the least objectionable, since they appear to have the least tendency to disturb the digestive functions.

Action of "Saccharin" on Digestive Ferments. L. Nencki. (*Pharm. Zeitung*, 1900, 112.) The author finds that moderate quantities of "saccharin," such as are used as additions to articles of food and beverages, have no disturbing effect on the digestive functions. The influence in this direction is found to be less than that of quantities of sugar producing the same amount of sweetness. Wines, even the lighter kinds such as hock, etc., interfere with the action of digestive ferments in a much greater degree than the small proportions of saccharin generally employed. The author is therefore inclined to regard the use of this substance as a sweetening agent as harmless.

Crystallisation of Egg Albumin. T. B. Osborne. (*Journ. Amer. Chem. Soc.*, xxi. 477; *Pharm. Journ.*, 4th series, ix. 159.) The author finds that the crystallisation of egg albumin is promoted on adding acetic acid to the half-saturated ammonium sulphate solution, as pointed out by Hopkins (*Journ. Physiology*, xxiii. 131), because the crystallised egg albumin is a compound of the protein substance with acid. When the albumin is first mixed with the ammonium sulphate solution an alkaline reaction towards litmus can be detected, and a decided odour of free ammonia develops. After this solution has stood for some hours all evidence of free

ammonia disappears, and the solution is then perfectly neutral to litmus, continuing so during the gradual separation of the albumin. The deposited substance, whether in the form of spheroids or crystals, reacts distinctly with litmus and with phenolphthalein, when filtered out and dissolved in water. By the addition of acetic acid, as directed by Hopkins, the albumin is obtained completely crystallised by a single precipitation, and without any concentration by evaporation. But the author finds that the substitution of a molecularly equivalent quantity of hydrochloric acid for the acetic acid causes the separation to take place even more quickly.

Crystalline Blood Albumin. S. Gruzewska. (*Journ. de Pharm.* [6], x. 125.) From the blood serum of the guinea-pig, cat and ox, the author has succeeded in obtaining crystals of albumin by prolonged freezing of the serum after previous centrifugation and removal of globulins by means of ammonium sulphate.

Action of Heat, Dilute Acids, and Alcohol on Albumin. A. A. Panormoff. (*Journ. Russ. Chem. Soc.*, 1899, 556–560. From *Journ. Chem. Soc.*) When 0·05–0·5 per cent. solutions of albumin in hydrochloric, hydrobromic, phosphoric, pyrophosphoric or metaphosphoric acid are dialysed at the ordinary temperature, acid solutions are obtained in all cases but the last, metaphosphoric acid alone forming a precipitate. The rotatory power of these acid solutions differs from those of the original solutions and is still further increased by heating at 100°. In both cases, compounds of albumin with the acids are formed, and the change of rotatory power must therefore be due to polymerisation or depolymerisation. These polymeric compounds have also a different solubility in water. The compounds obtained by dialysing the cold solutions, when reduced, regenerate the original albumin, but the compounds prepared by heating at 100° yield only amorphous compounds of the same composition. The formula Alb, 5 HCl, in which Alb = $C_{258}H_{422}O_{83}N_{63}S_3$, is ascribed to the hydrochloride and Alb, 3H Br to the hydrobromide. Phosphoric acid forms compounds containing $2H_3PO_4$, $3H_3PO_4$, and $4H_3PO_4$ respectively, according to the concentration of the acid, and pyrophosphoric acid compounds containing $3H_4P_2O_7$ or $7H_4P_2O_7$. By heating either of the two latter compounds with a 0·2 or a 0·5 per cent. solution of pyrophosphoric acid, the compounds Alb, $4H_3PO_4$ or Alb, $5H_3PO_4$ are formed respectively. The albumin obtained by evaporating dialysed albumin in a vacuum or by coagulating it at 100° and finally drying at 100° in a stream of hydrogen, has properties which differ from those of the albumin prepared by precipitating

with alcohol and ether and drying in a similar manner, although both have the composition given above.

Oxidation of Crystalline Egg-Albumin by Hydrogen Peroxide. F. W. Schulz. (*Zeitschr. physiol. Chem.*, 1900, 86–104.) By the action of hydrogen peroxide on crystallized egg-albumin, a new substance, *oxyprotein*, with the general characters of oxyprotosulphonic acid, is obtained; this is an oxidation product, not a decomposition product of albumin. There is, however, a difference between the two substances mentioned; the sulphur of the proteid which can be removed by alkali is not oxidised, but is so much diminished that more delicate methods have to be adopted for its detection. The hydrolysing action of hydrogen peroxide is ascribed to the fact that this reagent strengthens the hydrolysing action of acid and alkalies. The crystalline proteid used in these experiments was prepared by the acid method; it differs from the crystalline egg-albumin prepared by Hofmeister's method in elementary composition, and is probably in a hydrated condition.

Formation of a Sugar from Egg-Albumin. P. Mayer. (*Chem. Centr.*, 1899, 687.) By boiling purified egg-albumin with a 4-5 per cent. solution of hydrochloric acid for 6 hours, a carbohydrate was obtained, which dissolved in glacial acetic acid, forming a lævorotatory solution. The sugar thus obtained proved to be a hexose, and yielded an osazone, the composition and properties of which were identical with those of glucosazone. The albumin used in this investigation was quite free from glucose, and was prepared by removing the fat from yolk of egg by means of ether, and then treating with water and alcohol.

Sugar from Albumin. F. Müller and J. Seemann. (*Deutsch. med. Wochenschr.*, xxv. 209–211.) The authors state that the sugar formed from albumin in diabetes does not exist preformed in the albumin molecule, but is produced from the atomic complexes containing nitrogen by a process of oxidation with elimination of nitrogen.

Substances in the Liver which are Converted into Sugar by Acids. J. Seegen. (*Journ. Chem. Soc.*, 1900, ii., 29, from *Centr. Physiol.*) After liver-extract has been heated with hydrochloric acid, more sugar is found than corresponds with the sugar and glycogen contained in the extract. The substance prepared from liver-extract by means of 90 per cent. alcohol contains nitrogen, reduces alkaline copper solutions, and, when heated with acids, yields a sugar with reducing properties, but the quantity so obtained is far too little to account for the excess of sugar

formed from the extract by acid, hence the liver must contain yet another compound which is easily converted into sugar. The carbohydrate groups of the albumin are supposed to be affected by the action of the liver in such a way that they easily form sugar by the action of hydrochloric acid.

Antipeptone. M. Siegfried. (*Zeitschr. für physiol. Chem.*, xxvii. 335–347.) By the tryptic digestion of proteid antipeptone is formed. It is not precipitable by ammonium sulphate; it gives a strong biuret (but not Millon's) reaction, and is free from sulphur. In opposition to Kutscher, who regards antipeptone as a mixture of several substances, it is stated that antipeptone of constant composition can be prepared from impure antipeptone by treating it with alcohol. It can also be prepared pure by precipitation with iron salts in a solution saturated with ammonium sulphate.

Lilienfeld's Synthesis of Peptone. M. Klimmer. (*Journ. Chem. Soc.*, 1900, i. 72.) A comparison of Lilienfeld's synthesised preparation with true peptone has satisfied the author that the former is not peptone. It does not give the biuret reaction, and is easily decomposed into its two constituents, phenol and aminoacetic acid, of which it is a condensation product.

Histons. I. Bang. (*Zeitschr. für physiol. Chem.*, xxvii. 463–486. From *Journ. Chem. Soc.*) The term histon has been applied to various proteids. It was first used by Kossel for a proteid extracted from nucleated red blood corpuscles with hydrochloric acid; next, Lilienfeld separated from the thymus, spleen, and testis a histon combined with nuclein (nucleohiston); then Mathews regarded the substance arbacin, which he prepared from the sea-urchin (*Arbacia*), as a histon; and, lastly, Schulz regards globin, the proteid constituent of hæmoglobin, as belonging to the same category. These four substances differ from each other very considerably in elementary composition, and the present inquiry was to determine whether the histons should be regarded as a separate, well-characterised group of proteids. The substances examined were the four just mentioned, except that in place of arbacin the similar substance (scombrine prepared from mackerel sperm) was used. It is admitted that the histons give no single distinctive reaction; but, from the fact that all give a certain number of reactions, the group is considered to be sufficiently well defined. These reactions are the following:—(1) They are precipitated by ammonia, and the precipitate is insoluble in excess of that reagent in the presence of ammonium salts; (2) they are

precipitated by nitric acid; the precipitate dissolves on heating, and reappears on cooling; (3) they are precipitated by boiling in a neutral solution, except when the solution contains little or no salt; (4) neutral solutions are precipitated by alkaloidal reagents; and (5) they precipitate albumin from its solutions.

The Proteids of the Thyroid Gland. A. Oswald. (*Zeitschr. physiol. Chem.*, xxvii. 14–49.) The principal proteid of the thyroid gland, the one to which the iodine is linked, and to which extracts of the gland owe their action, is a globulin; it is called thyreoglobulin, and contains 1·6 per cent. of iodine. A nucleoproteid is also present. In thyreoglobulin, artificial pancreatic digestion leads to the formation of tyrosin, without any liberation of iodine; the iodine is, therefore, not united to the tyrosin group. By heating thyreoglobulin with 10 per cent. sulphuric acid, Baumann's iodothyrin was obtained; this is free from phosphorus.

Bromine in Thyroid Glands. M. Baldi. (*Répertoire* [3], xi. 308.) The author calls attention to the occurrence of traces of bromine in the thyroid glands of sheep. Details of a process for its detection are given.

Normal Occurrence of Arsenic in Animals and its Localisation in Certain Organs. A. Gautier. (*Comptes Rendus*, cxxix. 929–936, and cxxx. 284–291.) The author calls attention to the normal occurrence of minute quantities of arsenic in certain parts of the organism, but chiefly in the thyroid gland, in which, like phosphorus, it appears to exist in the nucleins. The organs (human and animal) in which this element has been detected are the following:—thyroid gland, 0·75 milligramme per 100 grammes; mammary gland, 0·13 per 100 grammes; brain, variable quantity, sometimes *nil*; thymus, appreciable amount; hair, horn, skin, milk, and bone, traces only. No arsenic could be detected in:—liver, kidney, spleen, muscle, testicle, seminal fluid, pituitary gland, pancreas, mucous membrane, cellular tissue, salivary glands, suprarenal capsules, ovary, uterus, marrow, blood, urine, and fæces.

The author points out that those organs which are most commonly examined for arsenic in cases of poisoning are normally free from that element. In the case of an exhumed, putrified corpse, where the normal traces of arsenic may have diffused themselves throughout the whole body, he considers the dilution of these traces to be so great as to preclude detection. He, therefore, does not seem to apprehend that these exceedingly small quan-

tities of arsenic normally occurring in certain organs need increase the difficulty of proving the presence or absence of toxic or fatal quantities of this substance in forensic investigations.

Human Bile. R. von Zeynek. (*Chem. Centr.*, 1899, ii. 213–214. From *Journ. Chem. Soc.*) The quantity of bile secreted in a day amounts to 300–400 grammes, containing 7–12 grammes of solid matter; it is strongly alkaline, and has a sp. gr. of 1·011–1·012. The bile pigments are completely precipitated by basic lead acetate, but only partially by the normal salt; the bile acids, mucin, and the colouring matter are thrown down by saturating with ammonium sulphate. Only a slight precipitate is formed by supersaturating with magnesium sulphate. Hydrochloric or sulphuric acid gives an amorphous precipitate and the liquid becomes deep green, and gradually deposits the bile acids. Bile gives a yellow coloration with alkalies; this is shown best by samples which have become of a greenish tinge by exposure to the air. The precipitate obtained by means of alcohol, when rubbed with glycerin, is capable of converting starch into sugar, but does not digest albumin. The bile secreted by the patient during each hour of a day was examined and found to be of a sp. gr. 1·011 and to contain in 1000 parts, 21·88 of solids, 2·39 of mucin, 13·8 of alkali salts of the bile acids, 8·96 of soluble salts, and 0·23 of insoluble salts. Another sample had a sp. gr. of 1·012 and yielded 30·76 of solids, 2·087 of mucin, 18·31 of alkali salts of the bile acids, 0·78 of lecithin, 2·307 of cholesterol and fat, 9·10 of soluble salts, 0·31 of insoluble salts, 0·054 of ammonia and trimethylamine, and 2·087 of acid ethereal extract. On one day when 336·73 grammes of bile were secreted, the solid residue amounted to 10·69 grammes; the amounts of the former per hour varied from 2·01 to 30·25 grammes, and of the latter from 0·054 to 0·99 gramme. The ash is principally made up of sodium chloride, the insoluble portion containing traces of iron and copper.

By adding zinc chloride and excess of ammonia to a very dilute aqueous solution of bile, a green coloration is formed in ½–1 hour, and the liquid shows a characteristic band in the red part of the spectrum about 650 $\mu\mu$ wave-length. Human urine containing bile pigments and bilirubin also give this reaction.

Human Blood. S. Jellinek and F. Schiffer. (*Chem. Centr.*, 1899, ii. 721.) The authors have made a series of determinations, the results of which show that ordinary healthy blood has a specific gravity of 1·060–1·065, leaves 22·26–23·94 per cent. of dry residue, and contains 0·0431–0·0527 per cent. of iron.

Neutral Hæmatin. V. Arnold. (*Zeitschr. physiol. Chem.*, xxix. 78–85.) Neutral hæmatin, which has not been described before, is of a yellowish-red colour; the yellow tint, as in oxyhæmoglobin, being more pronounced on dilution. It shows two absorption bands rather nearer the violet end of the spectrum than those of oxyhæmoglobin. It can be obtained from oxyhæmoglobin or more readily from methæmoglobin solution by adding sodium chloride and then from a third to one half the volume of alcohol; the presence of the salt prevents precipitation by the alcohol. It may also be obtained by neutralising a solution of alkaline hæmatin, and dissolving out with alcohol in the presence of salt; dilution with water precipitates it. By heat the red colour is changed to brown, and the spectrum of alkaline hæmatin is seen; the colour and absorption bands of neutral hæmatin return on cooling.

Hæmatin from the Blood of Various Animals. P. Cazeneuve and P. Breteau. (*Comptes Rendus*, cxxviii. 678–680.) Defibrinated blood is heated to boiling with its own weight of sodium sulphate; the coagulum produced is washed with hot water, and triturated with a warm 1 per cent. alcoholic solution of oxalic acid, this treatment being repeated until the residue is decolorised. The filtered extract is almost neutralised with ammonia; the precipitated hæmatin, after collecting and washing with cold alcohol, is redissolved in dilute ammonia (5 per cent.), and again precipitated by acetic acid, washed with cold water, alcohol, and ether, and finally dried at 135°. By this process 1 gramme of hæmatin is obtained from a litre of blood. Specimens of hæmatin prepared in this way from the blood of the horse, ox, and sheep show differences in composition which indicate that they are distinct chemical species.

Cystin as a Decomposition Product of Keratin. K. A. H. Mörner. (*Zeitschr. physiol. Chem.*, xxviii. 595–615.) Cystin was observed among the decomposition products (tyrosin, etc.) which separated on heating horn with 25 per cent. hydrochloric acid on a water-bath for several days. 450 grammes of dry keratin treated in this way yielded 11 grammes of cystin.

Occurrence of Cystin in Impure Well Waters. H. Causse. (*Comptes Rendus*, cxxx. 579–581.) Some impure well waters, which had caused typhoid fever, were found to contain cystin. The same waters contained a large number of bacteria having a liquefying action on gelatin, and especially of *Bacterium termo*;

but a search for the typhoid bacillus gave negative results. For the detection and estimation of cystin in such cases the following process is recommended:—A 5 per cent. solution of sodium-*p*-amido benzenesulphonate is made, and precipitated by mercuric chloride; the washed precipitate is dissolved in saturated sodium chloride solution, and will then keep for any length of time. At the moment of using, it is diazotised by a 0·4 per cent. solution of potassium nitrite. In a stoppered vessel are placed 100 c.c. of the water to be examined, 5 c.c. of the chloromercurate reagent, 2 c.c. of the potassium nitrite solution, and 15 drops of normal hydrochloric acid. The whole is shaken and left to itself in the dark for six hours, when an orange colour develops if cystin be present, which is not destroyed on the addition of sulphurous acid and further standing for two hours. This may be used either as a qualitative test for cystin, or, by comparison with similar tests worked on known amounts of cystin, as a quantitative method for its estimation.

A Ptomaine resembling Aconitine. M. Mecke. (*Zeitschr. öffentl. Chem.*, v. 204-206. From *Journ. Chem. Soc.*) A ptomaine with properties very similar to those of aconitine has been found in a corpse. This alkaloid is extracted from alkaline solutions by ether, and gives the general reactions of the alkaloids, forming with phosphotungstic acid a white, with phosphomolybdic acid a yellow, and with a solution of iodine in potassium iodide a brownish precipitate. It gives a faint turbidity with mercuric chloride, and with concentrated sulphuric acid it forms, after a time, a reddish-violet coloration, which changes to a darker shade on warming. It remains colourless with dilute sulphuric or phosphoric acid, but becomes violet on evaporating. The yellowish solution in nitric acid, when evaporated, leaves a yellow residue which turns orange when moistened with potassium hydrate solution. Even very small quantities instantly reduce potassium ferricyanide, and with Fröhde's reagent the alkaloid gives a greenish coloration, changing to yellowish-brown on warming. It is not precipitated by tannic acid, and after adding bromine water it is not attacked by concentrated sulphuric acid; potassium dichromate has also no action on it.

The violet coloration obtained by treating aconitine with phosphoric acid or concentrated or dilute sulphuric acid is only slowly formed, and differs from that of the corpse alkaloid both in shade and intensity. Delphinine, although stated by Otto to give a violet coloration with phosphoric acid, was found to produce only

a brownish coloration, and its behaviour with sulphuric acid and bromine is not like that of the ptomaine.

The present methods of testing for aconitine are only to be trusted when considerable quantities are present and decomposed animal matter absent. Hilger and Tamba's reaction with phosphoric acid is not available in presence of ptomaines, and, moreover, is scarcely characteristic of aconitine, for the different commercial varieties give different reactions. Urine which is several days old, when evaporated with phosphoric acid, also gives the same violet coloration as aconitine. The reactions with concentrated sulphuric acid, potassium ferricyanide (Brouardel-Boutmy's reaction), and Fröhde's reagent are also untrustworthy. According to Jürgens, characteristic crystals of aconitine potassium iodide are obtained by dissolving the alkaloid in a drop of dilute acetic acid, evaporating with a grain of potassium iodide, and washing with water, but in many cases this test gave only amorphous precipitates or the tabular crystals of pseudoaconitine.

Physiological Action of Protamines and their Decomposition Products. W. H. Thompson. (*Zeit. physiol. Chem.*, 1900, 1–19.) The protamines are toxic; they cause a fall of blood pressure, acting like albumoses on the peripheral vessels directly; blood coagulation is slowed, and the number of leucocytes in the circulation is lessened. The heart and respiration are also affected. Histons have a very similar action. The substances obtained by the hydrolysis of protamines (protons, hexon bases) have no such effects.

Action of some Morphine Derivatives on Respiration. H. Winternitz. (*Therap. Monatsh.*, September, 1899.) Whilst the alkyl-morphine derivatives codeine and dionin hardly affect respiration, the acetyl derivatives, diacetylmorphine and monoacetylmorphine exacerbate breathing by stimulation of the respiratory centre. The action of morphine on respiration is thus weakened by the introduction of alkyl radicles, and increased by that of acetyl.

Assimilation of Iron. E. Abderhalden. (*Zeit. Biol.*, 1900, 193, and 487.) Experiments are quoted in support of the contention that the iron of inorganic compounds, hæmoglobin, and of hæmatin in the food is absorbed, and leads to an increase of body weight and of the blood pigment. The most important fact now added is that animals on their normal diet assimilate more iron than those kept on a diet poor in iron, to which inorganic iron salts, hæmoglobin or hæmatin, has been added.

Absorption of Iodine by the Skin, and its Localisation in certain Organs. F. Gallard. (*Comptes Rendus*, 1899, 1117–1120, and 1900, 858–861.) The author's experiments on man and animals show that aqueous solutions of iodides can be absorbed through the skin, and that the iodine thus introduced into the system is subsequently eliminated with the urine and fæces. The elimination in this case, however, proceeds slowly, so that some accumulation occurs in the tissues. This is found to be chiefly the case in the brain and the glands. The organs which are richest in phosphorus and nuclein compounds appear to have the greatest power of absorbing iodine. The rate of elimination of the iodine seems to vary considerably with the diet.

Excretion of Urine Constituents in Fever. W. von Moraczewski. (*Virchow's Archiv.*, clv. 11–43. From *Journ. Chem. Soc.*) Numerous constituents of the urine were estimated in the several stages of different cases of fever, and the results are given in fullest detail. The general results are in the main confirmatory of earlier investigations. Some importance is attached to the observation that in an early stage of a fever the amount of chlorine in the urine rises, and that of phosphorus falls; the reverse occurs later on.

Effects of the Administration of Benzoic Acid on the Urine. W. Ashurst. (*Phil. Med. Journ.*, Feb. 24th, 1900.) The author's observations explain the value of benzoic acid when administered internally in the cystitis of gout and other catarrhal conditions of the bladder and urinary tract. He finds that this acid has a marked influence in retarding indefinitely the occurrence of alkaline fermentation in the urine, and that this influence is not due to its own acidity but to its antiseptic properties. The decomposition of urea into ammonia and carbon dioxide is prevented, and the dangers of ammoniacal cystitis and its complications avoided. The urine of patients taking benzoic acid can be exposed to the air for days without any appreciable development of bacterial life.

Indicanuria produced by the Administration of Oxalates. E. Harnack and E. von der Leyen. (*Zeitschr. physiol. Chem.*, 1900, 205–221.) The authors find that the condition known as indicanuria, characterised by the occurrence of appreciable quantities of indican in the urine, can be readily induced by the internal or subcutaneous administration of oxalic acid or sodium oxalate. Non-toxic doses of the latter prove sufficient to bring

about this result. The authors believe that the indican is the outcome of disordered tissue metabolism.

Alcaptonuria. A. B. Garrod. (*Medico-Chir. Trans.*, 1899, vol. 82, iii., 367. From *Pharm. Journ.*) In the condition known as alcaptonuria the urine contains a reducing body which may be mistaken for sugar (see *Year-Book of Pharmacy*, 1898, 90). The urine, when first passed, is normal in colour, but afterwards becomes deep brown; it reduces Fehling's solution and ammoniacal silver nitrate, but not bismuth; it has no rotatory power and does not ferment. The anomaly in the majority of instances dates from early childhood; it may last for life, and sometimes occurs in families; on the other hand it may be quite a temporary feature. Various substances have been isolated from the urine—pyrocatechin, uroleucic acid, and homogentisinic acid. It would seem that the main characters of the urine in alcaptonuria are due to the last-named substance, homogentisinic acid. This is hydroquinone-acetic acid with the formula $C_8 H_8 O_4$. It may be separated from the urine by two methods: the first (Wolkow and Baumann) is acidification with dilute sulphuric acid, repeated extraction with ether, distillation of the ether, solution of the syrupy residue in water, and addition to the boiling solution of a concentrated solution of basic lead acetate. A simpler method (Garrod's) is to heat the urine to boiling, add five or six grammes of solid lead acetate to every 100 c.c., and filter off the bulky precipitate. By either method the resultant fluid on standing deposits acicular or prismatic crystals of lead homogentisinate.

Detection of Urochloralic Acid in Urine after Administration of Chloral Hydrate. D. Vitali. (*Chem. Centr.*, 1899, ii. 147.) The urine to be tested is concentrated by evaporation to half its volume, and treated with a small excess of lead acetate and sufficient ammonia to produce slight alkalinity. The precipitated lead urochloralate is washed, then warmed with dilute sulphuric acid, and the filtrate cohobated for half an hour with zinc powder and sulphuric acid. The trichloroethyl alcohol resulting from the hydrolysis of urochloralic acid is thereby reduced to ethyl alcohol, which, after removal of the zinc by sodium carbonate, can be distilled over lime and recognised by its odour, inflammability, conversion into iodoform, and into acetaldehyde, as well as by other tests.

Estimation of Oxalic Acid in Urine. E. Salkowski. (*Zeitschr. für Analyt. Chem.*, 1899, 394.) Half a litre of urine is evaporated to one-third its volume, mixed with 20 c.c. of hydro-

chloric acid of 1·12 specific gravity, and extracted three successive times by shaking with 200–250 c.c. of ether containing 5–10 per cent. of alcohol. The ethereal extract is filtered through a dry filter, distilled, and after addition of water concentrated to about 20 c.c., the solution made feebly alkaline with ammonia, mixed with 1–2 c.c. of calcium chloride, and acidified with acetic acid. The precipitate of calcium oxalate is weighed in the usual manner. With a mixed diet, normal human urine contains on an average 0·128 gramme of oxalic acid per 100 grammes of nitrogen.

Detection and Estimation of Proteids, Diastases, Alkaloids, Leucomaines, and Toxins, especially in Urine. P. Chibret. (*Comptes Rendus*, cxxviii. 431–433. From *Journ. Chem. Soc.*) A solution of iodine, 47 grammes, and potassium iodide, 58 grammes, in water, 60 grammes, is employed as a reagent for the detection of nitrogenous bases, peptones, proteids, leucomaines, toxins, etc., in water or urine, and their approximate estimation by observing the degree of dilution at which a standard turbidity is produced. The reagent has no action on urea or uric acid.

In a very carefully cleaned tube, 2 c.c. of a solution of 1 part of cocaine hydrochloride in 800,000 parts of water is mixed with 3 drops of nitric acid and 3 drops of the iodine reagent, and the liquid seems to remain clear, but if very carefully observed under suitable conditions of lighting is found to be slightly opalescent; this is proposed as the standard of turbidity. It does not represent the limit of the reaction, which is 1 : 2,000,000, but is a convenient standard to work with. The degree of dilution necessary to give the same turbidity is, with egg albumin and peptones, 1 : 20,000; creatinine, 1 : 1000; xanthine, 1 : 5000; pepsin, 1 : 50,000, and alkaloids, 1 : 800,000. In the case of proteids in urine, if they are of alimentary origin the necessary dilution is from 1 : 20,000 to 1 : 50,000, but if they are pathological products they may require dilutions of 1 : 140,000 or even 1 : 400,000.

Normal urine gives the turbidity with a dilution of 1 : 30 to 1 : 40, but with malnutrition this may rise to 1 : 10. In the case of febrile and infectious diseases, the dilution may be 1 : 100 or even 1 : 200. The difference between the necessary coefficient of dilution before and after precipitation of the albumin gives the coefficient due to the albumin.

Detection of Albumin in Urine by means of Ammonium Persulphate. C. Strzyzowski. (*Schweiz. Wochenschr. Pharm.*, xxxvi. 545–546.) A 10 per cent. solution of ammonium persulphate is introduced by means of a pipette below the surface of the filtered

urine contained in a test-tube. The presence of albumin is indicated by a greyish-white turbidity in the zone of contact between the two liquids. A greenish turbidity thus produced would indicate the simultaneous presence of biliary matters. Urates or peptones do not interfere with the reaction.

Detection and Estimation of Albumin in Urine. R. Delaunay. (*Journ. de Pharm.*, [6], iii. 100–101.) The coagulation of albumin which takes place on boiling albuminous urine after very slight acidification with acetic acid, is not always quite complete, but it becomes so if the urine is previously saturated with sodium sulphate. For quantitative purposes it is necessary, of course, to free the precipitate from every trace of sulphate by copious washing with boiling water.

Detection of Albumin in Urine. G. Guérin. (*Journ. de Pharm.*, [6], ix. 576.) The reagent recommended is a 10 per cent. aqueous solution of di-iodoparaphenolsulphonic acid (sozoiodol), of which 10 to 15 drops are added to 10 c.c. of the filtered urine. The presence of albumin is indicated by the production of a whitish, flocculent precipitate or a milky turbidity which does not disappear on heating, while any precipitate due to albumoses, peptones, or alkaloids is readily dissolved by heat. Urates are not affected by this reagent.

Detection of Pus in Urine. M. Brandenburg. (*Pharm. Centralhalle*, from *Münch. med. Wochenschr.*, 1900, 183.) The urine is filtered, and the insoluble matter tested on the filter by the addition of a few drops of tincture of guaiacum. A blue coloration thus produced indicates the presence of pus. The coloration of the guaiacum is attributed to the nucleo-proteids contained in the pus. The addition of an oxidising agent, such as hydrogen peroxide or old oil of turpentine, which has been recommended by van Deen for the detection of blood by means of the guaiacum reaction, is not required in the case of pus.

Estimation of Uric Acid in Urine. A. Jolles. (*Zeitschr. physiol. Chem.*, 1900, 222–248.) The process described in this paper is based on the fact that uric acid, when boiled with an excess of permanganate solution in the presence of sulphuric acid, is completely converted into urea, which can then be estimated by the hypobromite process. The uric acid is first separated as ammonium urate by saturating the urine with ammonium acetate and adding sufficient ammonia to produce faint alkalinity. The precipitate is collected after a few hours, washed with a strong solution of ammonium carbonate, and then boiled with pure

magnesia until it is quite free from ammonia. The resulting liquid is acidified with sulphuric acid, then gradually mixed with an excess of permanganate solution, the mixture boiled, the excess of permanganate removed by oxalic acid, the liquid then cooled, and rendered alkaline with soda. The urea is now estimated with hypobromite in the usual manner.

Estimation of Uric Acid. E. Mallet. (*Zeitschr. für analyt. Chem.*, 1899, 396–397.) 100 c.c. of the urine are mixed with 10 c.c. of a 16 per cent. solution of sodium carbonate, the mixture is filtered, and the uric acid precipitated from 82 c.c. of the filtrate as copper urate. The latter is collected, washed till free from alkali, then dissolved in 500 c.c. of water containing 5 c.c. of sulphuric acid, and titrated with decinormal permanganate. The number of c.c. of permanganate used corresponds exactly to the number of centigrammes of uric acid per litre of urine.

Volumetric Estimation of Uric Acid. E. Gautrelet. (*Bull. Com.*, xxvii. 519.) 20 c.c. of the urine are neutralised with weak alkali, acidulated with 5 c.c. of 15 per cent. acetic acid and titrated with an aqueous copper solution containing 2·4 grammes of copper sulphate, 5 grammes of sodium sulphite, and 5 grammes of acetic acid per litre. This solution is added drop by drop, and a drop of the mixture is tested at frequent intervals on a white slab with a drop of an indicator prepared from 0·2 gramme of potassium ferricyanide, 5 drops of hydrochloric acid, and 100 c.c. of water. The end of the reaction is recognised by the appearance of a red colour of the mixed drops on the slab. Each 0·1 c.c. of the copper solution used represents 0·01 gramme of uric acid per litre of urine. The indicator should be freshly prepared.

Clinical Estimation of Mercury in Urine. F. Eschbaum. (*Deutsch. med. Wochenschr.*, xxvi., 52–55. From *Journ. Chem. Soc.*) The urine is boiled with dextrose, and a sufficient amount of aqueous sodium hydrate to precipitate the phosphates. After pouring off the clear, supernatant liquid, the precipitate is dissolved in hydrochloric acid and then heated at 45–60° with copper gauze. This, after being duly washed with alkali, water, and alcohol, is dried for half an hour in the air and then heated in a glass tube; the mercury which condenses on the cold sides of the tube is removed by introducing a weighed piece of silver foil with which it instantly amalgamates. The increase in weight represents the mercury; by way of a check, the silver may be heated and the mercury found by the loss in weight.

The urine of patients treated with Werler's ointment, which

contains 10 per cent. of colloidal mercury, showed, after 48 hours, distinct traces of mercury; this could still be detected for six weeks after the cure.

Separation of Silver Chloride from Mercurous Chloride by Ammonia. F. Leteur. (*Chemical News*, lxxxi. 95.) The separation of silver and mercurous chlorides by treatment with ammonia is incomplete whenever the mercurous chloride forms a considerable portion of the mixture, as in that case the black mercurous chloroamide, $NHg_2H_2.Cl$, which is left undissolved, always retains some of the silver chloride. To obviate this the author suggests the following mode of procedure. The residue from the treatment of the mixed chlorides with aqueous ammonia is digested in the cold with concentrated nitric acid, to which is added sufficient hydrochloric acid to transform the black mercurous compound into mercuric chloride. If silver be present there remains a white residue of silver chloride, which is not blackened by solution of ammonia, but is completely soluble in it. If the residue does not present these characters the same treatment must be repeated.

Colorimetric Estimation of Nickel. M. Lucas. (*Bull. Soc. Chim.*, 1899, 432–433.) For the rapid approximate estimation of nickel in steel, the author makes use of the red coloration produced in alkaline or neutral solutions of nickel by potassium or ammonium thiocarbonate, a large excess of which must be added to obtain a uniform and persistent coloration. As copper and cobalt solutions also give colorations with thiocarbonates, these metals must be removed; the presence of cobalt is readily detected by the fact that the colour produced by ammonium thiocarbonate with cobalt salts is much darker than that obtained with the potassium salt. The process is carried out as follows:—a graduated scale of tints is made by preparing a number of solutions of equal volumes containing equal quantities of the thiocarbonate to which have been added known and increasing proportions of nickel and about equal proportions of ammonium salts. 0·5 gramme of the steel is then dissolved in nitrohydrochloric acid and the iron separated by two successive precipitations with ammonium chloride and ammonia solution; the liquid is then diluted to 500 c.c. Two separate quantities of 50 c.c. are taken and to one 10 c.c. of ammonium thiocarbonate solution are added, and to the other 10 c.c. of the solution of the potassium salt. If the former is much darker than the latter, cobalt is present and must be removed; but if not, the liquid is com-

pared with the series of liquids containing known quantities of nickel.

Volumetric Estimation of Zinc. M. Pouget. (*Comptes Rendus*, cxxix. 45–47.) The acid solution, mixed with sodium acetate, is treated with gradual additions of ammonia until a permanent precipitate is produced, and then with an excess of sulphuretted hydrogen solution. The liquid is boiled until every trace of H_2S is driven off, cooled, a known quantity, in excess, of standard iodine solution added; and after standing to complete the decomposition of the zinc sulphide, the excess of iodine is determined by titration with sodium thiosulphate in the usual manner. In this process, the troublesome filtration and washing of the precipitated zinc sulphide are avoided.

A New Test for Copper. D. Vitali. (*Chem. Centr.*, 1899, 990.) When solutions of copper salts are treated with an alkaline hydrate in presence of an excess of bromine water, a brown to black precipitate of the peroxide CuO_2 is formed. Chlorine or iodine may be used instead of bromine, but the reaction then takes place much more slowly. The presence of 1/100000th part of copper in 1 c.c. of a solution of crystallized copper sulphate may be detected by the intense yellow coloration produced by evaporating the solution and treating the residue with potassium hydrate solution and bromine water. By evaporating the solution to dryness, then adding a few drops of bromine water and again evaporating, a black residue of anhydrous copper bromide is left; and by this method even 1/1000000th part of copper in 1 c.c. of a solution of the sulphate may be detected.

Ammonium Molybdate as a delicate Reagent for Tin. A. Rogers. (*Journ. Amer. Chem. Soc.*, 1900, 220–221.) When the usual molybdate reagent is added to a solution of stannous chloride, a dark-blue coloration is produced, even if the stannous solution is extremely weak. The test is stated to be much more delicate than the reaction of stannous chloride with mercuric chloride.

Bettendorf's Test for Arsenic. F. Dietze. (*Zeitschr. analyt. Chem.*, xxxix. 44–45); also H. Enell. (*Ibid.* 45); also G. Frerichs. (*Ibid.* 45–46). Stannous chloride, to be suitable for use in Bettendorf's test, must be free from ammonium salts, sulphates, iron, and arsenic; all of which, besides other impurities, may be present in the commercial salt. When a solution of 1 gramme, dissolved in 5 c.c. of hydrochloric acid of sp. gr. 1·19, is boiled for several minutes, the solution must remain

clear and colourless for an hour. Titration with iodine should indicate at least 98·5 per cent. of the pure salt.

Arsenic acid is much more slowly reduced by stannous chloride than is arsenious acid, heat accelerates the reaction. To detect traces of arsenic, the liquid should be passed through a very small filter, which is then spread out upon white paper. Arsenic appears as a reddish-brown stain.

The reaction is capable of detecting 0·06 milligramme of arsenic in the form of arsenic acid or 0·013 milligramme in the form of arsenious acid. Gutzeit's test is equally sensitive.

Detection and Estimation of small Quantities of Arsenic in the Presence of Organic Substances. A. Gautier. (*Comptes Rendus*, cxxix. 936–938.) The organic matter is destroyed by successive treatment with nitric acid, sulphuric acid, and, finally, nitric acid again. The arsenic is precipitated, together with an excess of sulphur, by sulphuretted hydrogen, and the arsenious sulphide extracted from the washed precipitate with ammonia. The ammoniacal solution is evaporated, the residue oxidised by a mixture of nitric and sulphuric acids, the nitric acid then expelled by heating, and the resulting liquid tested by Marsh's method.

Detection of Arsenic in Carpets. O. Rössler. (*Archiv. der Pharm.*, ccxxxvii. 249.) The following is recommended as a convenient and expeditious test:—A fragment of the carpet is rolled up in a coil of platinum foil and heated in the upper part of the flame of a Bunsen's burner, under a glazed porcelain dish filled with cold water. The under side of the dish is now moistened by means of a glass rod with a drop of solution of silver nitrate, then held for a few seconds over a glass stopper moistened with ammonia, and exposed to a strong current of air. The presence of arsenic will thus be indicated by the formation of a yellow stain due to silver arsenite.

Separation of Manganese Oxide, Magnesia, and the Alkaline Earths. A. Villiers. (*Journ. Chem. Soc.*, 1899, ii. 523–524, from *Bull. Soc. Chim.*) Notable quantities of these oxides are precipitated when a ferric salt is added to an acetic acid solution of their phosphates, and when a mixture of recently precipitated ferric and calcium phosphates is treated with acetic acid only a portion of the calcium passes into solution. The quantitative separation of phosphoric acid from these oxides by the ferric phosphate method is only possible when the iron is present in considerable excess. The solution under examination is evaporated with hydrochloric acid to remove silicic acid, and ignited to

remove organic substances; this treatment destroys oxalic acid, but when manganese is present, this acid may be oxidised to carbonic anhydride by warming the solution with aqua regia. Phosphoric acid being present, the solution is partially neutralised with ammonia, and the slight precipitate produced is re-dissolved in the least possible amount of hydrochloric acid. Unless iron is present in sufficient excess, the addition of an alkali acetate produces a precipitate of ferric phosphate; if a turbidity appears, ferric chloride is added until the phosphate is re-dissolved; the solution should remain clear on adding a further quantity of alkali acetate. The solution is boiled, and if the supernatant liquid retains the colour due to ferric salts, more alkali acetate is added; the ferric phosphate should be filtered as rapidly as possible, otherwise traces of iron will pass into solution owing to the action of atmospheric carbonic anhydride; these are removed by boiling the solution and repeating the filtration. The filtrate, when rendered ammoniacal, yields a precipitate which is added to the preceding, and the whole examined for aluminium and chromium; the final filtrate contains manganese, the metals of the alkaline earths, and magnesium; these are separated by the ordinary methods.

Volumetric Estimation of Potassium. R. H. Adie and T. B. Wood. (*Proc. Chem. Soc.*, No. 218, 17–18.) The method proposed by the authors is to precipitate the potassium as cobaltinitrite—of which the formula is usually given as $K_6 C O_2 (N O_2)_{12} 3 H_2 O$—and to titrate the nitrite with a standard solution of potassium permanganate in acid solution. Their experiments so far seem to show that there are three, instead of two, nitrite groups for each atom of potassium, and that the precipitate they obtain is probably an acid salt, as the ratio of the cobalt to the nitrite is that indicated by the above formula. The method is as follows:—

The solution containing the potassium to be estimated is freed from other bases, as far as possible, by means of sodium carbonate, then concentrated if the solution is at all weak, acidified with acetic acid and excess of a solution of sodium cobaltinitrite added. The mixture is allowed to stand for 24 hours, the precipitate collected on a Gooch filter, washed several times with 10 per cent. acetic acid, and finally once with water. The asbestos filter and the precipitate are now transferred to a beaker, and boiled with a dilute solution of soda, filtered, and made up to 100 c.c. Of this solution 20 c.c. are taken, acidified with dilute sulphuric acid, and rapidly titrated with the permanganate solution. A second fraction of 20 c.c. is taken, and to this the amount just found of

permanganate solution is added, then acidified, and the end point again determined. In one estimation, the volumes required were 16·3 and 16·4 c.c. respectively. The end of the reaction is more easily obtained if the permanganate is added to the nitrite solution in excess and the excess determined by potassium iodide and thiosulphate solution.

On testing the method with pure potassium salts, it was found that the results, whilst very concordant amongst themselves, gave results too high in almost exactly the proportion 3 : 2 ; 1 c.c. of the permanganate solution used was in this way found to correspond only to 0·0077 gramme of K_2O instead of to 0·01175, the value calculated from the formula given above. This seems to indicate for the precipitated salt some formula such as $K_2HCo(NO_2)_6$.

Analytical data showing the accuracy of the process are given in the paper.

The authors are engaged in making a more complete investigation of the composition of the precipitated cobaltinitrite and its decomposition by alkalies, as well as the application of the method to the determination of cobalt.

Volumetric Assay of Potassium Iodide. E. Vincent. (*Journ. de Pharm.* [6], x. 481–483.) A suitable quantity of the solution obtained by dissolving 1 gramme of the sample in a litre of water is mixed with an equal volume of a 0·2 per cent. solution of iodic acid, and the liquid added from a burette to 5 or 10 c.c. of decinormal thiosulphate solution until a permanent yellow tint is produced. 0·2 per cent. of potassium hydrogen carbonate is added to the thiosulphate solution in order to prevent oxidation of the latter by the excess of iodic acid. The process is expeditious and is stated to give accurate results.

Quantitative Separation of Chlorides and Iodides. L. Vanino and O. Hauser. (*Ber. der deutsch. chem. Ges.*, xxxii. 3617.) When a mixture of silver chloride and iodide is heated at 40° with formaldehyde dissolved in 50 per cent. potassium hydrate solution, the chloride is completely reduced, whilst the iodide remains unchanged. On treating the washed precipitate with nitric acid, the metallic silver derived from the chloride is dissolved, and can then be re-converted into chloride and weighed as such.

Qualitative Separation of Chlorates, Bromates and Iodates. D. Vitali. (*Chem. Centr.*, 1899, 1083-1084.) The author recommends the following process for the separation of these compounds :—By cautious addition of silver nitrate, the iodates and bromates alone are precipitated, the chlorates being left in solution.

The precipitated silver compounds are then decomposed with sulphuretted hydrogen, and after removing the silver sulphide by filtration, the excess of the former is expelled by warming, and the filtrate subsequently neutralised with soda and concentrated by evaporation. The iodine is liberated by means of potassium nitrite and sulphuric acid, and removed by shaking with chloroform; and the liquid may then be tested with chlorine water for bromine.

Analysis of Mixtures of Chlorate and Hypochlorite. H. Ditz and H. Knöpfelmacher. (*Zeitschr. für angew. Chem.*, 1899, 1195, 1198, 1217–1220. From *Journ. Chem. Soc.*) Chlorates, in the presence of potassium iodide and hydrochloric acid, liberate iodine, but the reaction is slow and uncertain and therefore not suitable for quantitative purposes. If, however, a solution of a chlorate is mixed with potassium bromide and a sufficiency of hydrochloric acid, bromine is liberated quantitatively and may then be estimated by the usual iodometric method. Hypochlorites behave similarly. 25 c.c. of the solution containing approximately 0·06 gramme of the chlorate are mixed in a generating flask with 20 c.c. of a 5 per cent solution of potassium bromide and 50 c.c. of strong hydrochloric acid are added from a separating funnel, the air which escapes from the flask passing through a bulb containing solution of potassium iodide to retain any bromine vapour. After 1 hour, the liquid is titrated as usual. Any hypochlorite is estimated by the Penot method and allowed for.

Volumetric Estimation of Boric Acid. J. Wolff. (*Comptes Rendus*, cxxx. 1128–1131.) The author employs a solution of ferric salicylate in sodium salicylate as an indicator for the titration of boric acid and its salts by acidimetry. This reagent develops a violet coloration with dilute mineral acids, which changes to orange when the solutions are neutralised or rendered alkaline by sodium hydrate; the acid reaction, however, is not produced by boric, phosphoric, or hydrofluoric acid. The indicator is prepared by dissolving 5 grammes of sodium salicylate in 25 c.c. of water, and adding solution of ferric chloride drop by drop, until a slight permanent turbidity is produced. The solution is filtered and divided into two equal parts, to one of which just sufficient dilute soda solution is added to give a distinct orange tint, while the other half is mixed with sufficient dilute sulphuric acid to develop a violet coloration; the two portions are mixed, and 10 grammes of sodium salicylate dissolved in the mixture. In order to estimate the boric acid present in a borate, the solution of the latter is acidified with a measured excess of standard sulphuric

acid, and the excess of the latter determined by means of standard alkali, in the presence of the above named indicator. The difference between the amount of acid used, and that found, gives the equivalent of the sodium in the salt. Glycerin is now added in excess to liberate the boric acid, which is titrated in the presence of phenolphthalein in the usual manner.

Detection of Borates. H. Bornträger. (*Zeitschr. für Analyt. Chem.*, xxxix. 92.) The green colour imparted to a non-luminous flame on heating free boric acid or a mixture of a borate and sulphuric acid on platinum foil may be much intensified by heating the borate with hydrofluoric acid, or with ammonium nitrate and chloride, or with mixtures of sulphuric and hydrochloric acids, sulphuric and nitric acids, or hydrochloric and nitric acids (but not with one of the acids alone). When performed in this manner, the test is more delicate than that with sulphuric acid and alcohol.

Estimation of Sulphuric Acid in the Presence of Iron. F. W. Küster and A. Thiel. (*Zeitschr. anorg. Chem.*, xxii. 424–444.) The authors have previously reported on the disturbing effect of ferric salts in sulphuric acid estimations by barium chloride, and have shown that this may be prevented either by previously removing the iron with ammonia, or by converting it into a salt which does not come down with the barium sulphate (see *Year-Book of Pharmacy*, 1899, 113). They now show that it may also be prevented by precipitating the barium sulphate in the cold, or by adding the hot solution of sulphuric acid and ferric salt to the barium chloride. The conversion of the ferric salt into ferrous salt by means of zinc, etc., is not recommended, for although the loss due to the formation of the complex acid is avoided, other much smaller errors are introduced by the precipitation of zinc sulphate and ferrous sulphate together with the barium sulphate.

Detection of Sulphates in the Presence of Thiosulphates. L. Dobbin. (*Pharm. Journ.*, 4th series, x. 182, 183.) The delicacy of the test for sulphates with barium chloride is impaired by the presence of thiosulphates, in which barium sulphate is appreciably soluble. In order to remove the disturbing influence, Salzer has recommended the conversion of the thiosulphate into tetrathionate by means of iodine before applying the test. The author of the present paper finds that the detection of sulphate in such a case is better accomplished by the method devised by Grossmann. The liquid is heated in a current of carbon dioxide, hydrochloric acid is added, and the sulphur dioxide expelled by prolonged boiling. The

remaining liquid is filtered and tested for sulphate with barium chloride.

Estimation of Free Oxygen in Water. L. Mutschler. (*Zeitschr. Unters. Nahr. Genussm.*, ii. 481. From *Journ. Chem. Soc.*) The method consists in enclosing in a bottle of about a litre capacity three sealed glass tubes, one of which contains an alkali, the second a known volume of decinormal ferrous ammonium sulphate, and the third an excess of 50 per cent. sulphuric acid. The acid tube is attached to the caoutchouc stopper, the others lie at the bottom. After filling the bottle with the water, the two former are fractured by a glass ball, and the ferrous hydrate diffused through the water. After a sufficient time, the acid tube is also fractured and the unoxidised ferrous salt titrated with decinormal permanganate.

Colorimetric Estimation of Phosphoric Acid in Water. A. Jolles. (*Chem. Centr.*, 1899, 375.) The author's process, which is based on the yellow coloration produced in exceedingly weak solutions of phosphates by heating with the molybdate reagent, is only applicable to solutions containing not more than 1 milligramme in 20 c.c. The water to be tested is acidulated with nitric acid, evaporated to dryness, the residue heated to 130° C., then treated with dilute nitric acid, any precipitated silica removed by filtration, and the filtrate diluted to a definite volume, of which 20 c.c. are employed for the test. The reagent, of which 1 c.c. indicates 1 milligramme of phosphoric anhydride, is made by dissolving 8 grammes of pure potassium molybdate in 50 c.c. of colourless nitric acid of 1·2 specific gravity. The liquid for comparison is made by suitably diluting a solution containing in 1 litre 53·23 grammes of re-crystallised di-sodium phosphate.

Determination of Phosphorus in Phosphorised Oils. E. Louise. (*Pharm. Journ.*, from *Journ. de Pharm.*, [6], x. 241.) The author advocates the use of the following method for the determination of phosphorus in phosphorised oils; it consists in precipitating the phosphorus from the oil, previously dissolved in acetone, by means of silver nitrate solution. From 8 to 10 grammes of the oil are weighed accurately into a graduated 200 c.c. measure, then made up to 200 c.c. with acetone, and well mixed. The acetone solution is then divided into 10 equal portions, each of 20 c.c., in a series of test tubes. Two solutions of silver nitrate are now made, one containing exactly 10 per cent., the other 1 per cent. of the salt. To the first of the series of test tubes two drops of the 10 per cent. solution of silver nitrate are added, by means of a Duclaux's drop-

counter, which discharges 100 drops of distilled water; the contents of the tube are then well mixed and filtered from the black precipitate which falls. If the filtrate shows no further blackening on the addition of another drop of the reagent, a more delicate test is made with the remaining nine tubes. To each of these 1 drop of the 10 per cent. silver solution is added; then, to the first, 1 drop of the 1 per cent. solution; to the second, 2 drops; 3 drops to the third, and so on. On filtering, the tube which gives a filtrate which does not further precipitate is noted; if, for example, this be at No. 5, containing the equivalent of 15 drops of 1 per cent. silver nitrate solution, the original oil will contain, in parts per mille of phosphorus,

$$\frac{15 \times 0{\cdot}05036 \times 10}{W}$$

where W = the original weight of the oil taken.

Estimation of Phosphorus in Organic Compounds. C. Marie. (*Pharm. Journ.*, 4th series, x. 69, from *Comptes Rendus*, cxxix. 766.) The following method is employed by the author to destroy organic matter in the determination of the phosphorus combined with it:—The substance is first dissolved in a considerable excess of nitric acid, the solution is heated on the water bath, and a small quantity of finely powdered potassium permanganate is added. This addition is repeated several times, as the red colour disappears, until, finally, the red tint persists for five or six minutes. The amount of permanganate requisite will be generally five or six times that of the organic matter. The mixture is then cooled, and a 10 per cent. solution of sodium or potassium nitrite is added, drop by drop, until the precipitated manganese oxide is dissolved, and a perfectly clear liquid is obtained. The solution is then heated to drive off nitrous fumes, and excess of nitric acid, and the phosphorus precipitated in the usual way, as phosphomolybdate. Care must be taken to wash the phosphomolybdate perfectly free from manganese, otherwise the results will be vitiated, and the magnesium ammonio-phosphate finally obtained will contain manganese. The washings must, therefore, be tested with lead dioxide, and filtration continued until no reaction for manganese is obtained. This method of analysis is found to be much more convenient than the ordinary one of oxidising in a sealed tube. It has given good results in the analysis of glycerophosphates.

Detection of Alcohol in Ether. M. Lassar-Cohn. (*Zeitschr. für analyt. Chem.*, xxxviii. 251.) A sample of the ether is shaken with water, the aqueous layer removed, and freed from dissolved

ether by gentle warming. The alcohol remaining in the water is oxidised by treatment with manganese dioxide and sulphuric acid, the resulting aldehyde removed by distillation, and then recognised in the distillate by means of Nessler's solution.

Detection of Acetaldehyde in Ether. H. Blaser. (*Pharm. Centralh.*, xl. 607.) The author employs a weak solution of magenta (1 : 100,000) decolorised by exposure to sunlight, instead of the usual reagent in which the decolorisation is effected by sulphurous acid. Increased delicacy is claimed for the reagent bleached in this manner.

Estimation of Alcohol and Ether in the Presence of Light Petroleum. H. D. Richmond. (*Analyst*, xxiv. 201–202.) *Estimation of Alcohol.*—20 c.c. of the mixture are shaken with 25 c.c. of water, saturated with ether, and the volume of the ethereal layer (A) is noted. The aqueous layer is drawn off and the liquid is again shaken with 25 c.c. of etherised water; the volume (B) of the ethereal layer is then again noted. Then $2A - B$ gives the volume of ether and light petroleum and $(20 + B - 2A) \times 5$ equals the percentage by volume of alcohol in the original mixture.

Estimation of Light Petroleum.—A mixture is prepared of 20 c.c. of 90 per cent. sulphuric acid and 20 c.c. of glacial acetic acid. When cold, 10 c.c. of the sample are introduced into a burette and the acid is gradually added, the mixture being well shaken after each addition. The ether and alcohol are completely dissolved, and the volume of light petroleum is then read off. Two satisfactory test-analyses are given.

Detection of Caramel in Spirits. C. A. Crampton and F. D. Simons. (*Journ. Amer. Chem. Soc.*, xxi. 355–358.) A sample of the suspected spirit is kept in contact with a definite weight of fuller's earth for some time; and a sample of a similar spirit known to be free from caramel is treated in exactly the same way at the same time. As the absorption of caramel by the fuller's earth is much greater than that of the natural colouring matter, the presence of the former will be indicated by the greater loss of colour caused by this treatment. By means of the tintometer the removal of colouring matter effected in this way can be roughly determined and expressed in percentage numbers. Of 40 samples of naturally coloured spirits, the highest and lowest percentage of colour removed was 25·0 and 8·3 per cent. respectively, the average of all the samples being 14·6 per cent.; whilst 18 samples of artificially coloured spirits gave a mean loss of colour

of 44·7, and a maximum and minimum of 54·1 and 40·0 per cent. respectively.

Determination of Ethyl Nitrite. R. C. Cowley and J. P. Catford. (*Pharm. Journ.*, 4th series, ix. 471, 472.) The author describes a method for estimating the percentage of ethyl nitrite in the official spirit and solution, without a nitrometer. It is an adaptation of one of the colorimetric processes for determining nitrites in water analysis, founded on the reaction between nitrous acid and meta-phenylene-diamine, producing the azo-compound commonly known as "Bismark-brown." Full details are given in the original paper, which should be consulted for particulars.

The Pharmacopœia Test for Chloral Hydrate. F. H. Alcock and T. H. Thomas. (*Pharm. Journ.*, 4th series, ix. 236.) The authors point out that the official test for chloral hydrate is liable to give erroneous results, unless heat is avoided, and the titration with sulphuric acid is carried out without delay after the chloral and standard alkali have been vigorously shaken together in a stoppered bottle for a few minutes. If these two substances are allowed to remain in contact for a longer time, especially at an elevated temperature, before the titration is made, the results are rendered inaccurate through the decomposing action of the alkali on the chloroform formed from the chloral hydrate.

The same sources of error are also pointed out by F. Pilkington Sargeant (*Ibid.*, 236–237).

Examination of Commercial Amylic Alcohol. H. D. Richmond and F. R. O'Shaughnessy. (*Journ. Soc. Chem. Ind.*, xviii. 107–109.) Amylic alcohol, to be suitable for analytical operations, should answer the following requirements :—The specific gravity at 15·5° C. should be 0·8145 to 0·816. The boiling point should not exceed 130·5°, at which temperature 23·5 c.c. should distil over from 25 c.c. of the alcohol ; 10 c.c. should give a clear and but slightly-coloured liquid on addition of 10 c.c. of hydrochloric acid of sp. gr. 1·17, and the addition of 1·5 c.c. of water should cause a permanent turbidity.

Volumetric Estimation of Iodoform in Dressings. M. Lehmann. (*Chem. Centr.*, 1900, 693.) 10 grammes of the material are treated in a stoppered bottle with 100 grammes of a mixture of 1 volume of ether and 2 volumes of alcohol at 15-20° for 30 minutes with frequent shaking. 10 grammes of the solution are mixed in an Erlenmeyer flask with 15–20 drops of fuming nitric acid, an access of decinormal silver nitrate is added, and the whole heated on the water bath until the silver iodide has deposited and the supernatant

liquid is colourless. When cold, the liquid is diluted with 125–140 c.c. of water, and the excess of silver titrated according to Volhard's directions.

Comparative Delicacy of Certain Tests for Formaldehyde. B. M. Pilhasy. (*Journ. Amer. Chem. Soc.*, xxii. 132–135. From *Journ. Soc. Chem. Ind.*) *Trillat's Test.*—This consists in heating a dilute solution of formaldehyde with a few drops of sulphuric acid and dimethylaniline for 30 minutes on the water-bath, then making the liquid alkaline, again heating to expel the excess of dimethylaniline, and filtering. On moistening the filter paper with acetic acid and sprinkling lead dioxide over it, a blue coloration is said to indicate the presence of formaldehyde.

The author describes a number of experiments, from which he concludes that this test does not show the presence of formaldehyde, but of dimethylaniline or its salts incompletely volatilised.

Lebbin's Test.—According to the author this test is not capable of detecting more than 1 part of formaldehyde in 200,000 of water.

Morphine Hydrochloride with Sulphuric Acid was not found to be sensitive for solutions of formaldehyde containing less than 1 part in 1000.

Phenylhydrazine Hydrochloride.—In the author's opinion this is the most sensitive test. 3 c.c. of a solution containing 1 part in 250,000, when heated with 5 drops of the reagent and 5 drops of sulphuric acid, gave a light green tint after 3 minutes, and a decided coloration after 10 minutes.

Rimini's Test.—The limit of sensibility was found to be about 1 in 1,000,000.

Examination of Essential Oils by means of Sodium Salicylate. M. Duyk. (*Bull. de la Soc. Roy. de Pharm. de Brux.*, xliii. 225. From *Pharm. Journ.*) The author finds that a saturated (1 : 1) solution of sodium salicylate, sp. gr. 1·14, is a useful solvent for separating many of the constituents of essential oils. It readily dissolves a number of alcohols, aldehydes, ketones, and phenols. The solution is perfectly clear, but again liberates the dissolved substances on dilution with water. In this way eugenol, geraniol, linalool, borneol, benzaldehyde, carvol, citral, carvone, cinnamic aldehyde, and citronellone may be separated from the oils containing them; esters and terpenes are insoluble in this reagent. Santalol, anethol, safrol, apiol, cineol, and camphor are only partially dissolved. This solution is applicable for the extraction of the soluble bodies from oils on the manufacturing scale as well as for their quantitative determination in the analytical examination of

essential oils. For the latter purpose a known volume (1 c.c.) of the oil is introduced into a burette, graduated with $\frac{1}{20}$ c.c., with three times its volume of the sodium salicylate solution, the whole is thoroughly shaken up, and allowed to separate; the clear lower liquid is drawn off, a fresh portion of the salicylate added, and the operation repeated. The volume of the insoluble oil is then read off. The details of the examination of various essential oils by this method are being published.

Separation and Estimation of Vanillin and Coumarin in Flavouring Essences. W. H. Hess and A. B. Prescott. (*Journ. Amer. Chem. Soc.*, xxi. 256–259.) The alcohol is removed by heating at 80°, lead acetate is then added so long as a precipitate forms, and the filtered solution is extracted with ether. The vanillin in the ethereal extract is extracted with ammonia, and after neutralising with 10 per cent. hydrochloric acid and drying below 55°, is taken up with light petroleum and evaporated in a weighed dish. The coumarin is similarly separated by evaporating the ethereal solution below 45°, extracting with light petroleum, and evaporating in a weighed dish. The vanillin and coumarin are identified by their melting points.

Determination of Mannose. E. Bourquelot and H. Hérissey. (*Comptes Rendus*, cxxix. 339. From *Pharm. Journ.*) The authors find that mannose may be determined quantitatively by means of its crystalline compound with phenylhydrazine, in the presence of other sugars, in consequence of the fact that the mannose compound crystallises readily and entirely from solutions at a temperature not exceeding 10° C. The phenylhydrazine reagent employed consists of phenylhydrazine, 2·4 c.c.; glacial acetic acid, 2.4 c.c.; distilled water to produce 12 c.c. The mixture is allowed to stand from eight to twelve hours, at 10° C.; the crystalline mass drained on the filter pump, washed successively with iced water, alcohol, and ether, is dried first *in vacuo* over sulphuric acid, then at 100° C., and weighed. When solutions containing less than 3 per cent. of mannose are operated on, a correction of 0·04 gramme for every 100 c.c. of solution should be made. Experiments show that mannose may be separated quantitatively by this method from mixtures containing galactose, arabinose, maltose, and dextrin.

Separation of Lactic, Butyric, and Valeric Acids. R. Schneider. (*Zeitschr. für analyt. Chem.*, xxxviii. 775–776.) The mixture is distilled with superheated steam, when butyric and valeric acids pass over, whilst lactic acid remains in the residue.

The distillate is evaporated to dryness with calcium carbonate, and extracted with alcohol, when calcium acetate and formate remain undissolved. From the solution, zinc nitrate precipitates zinc valerate in thin plates, and from the concentrated filtrate copper nitrate throws down copper butyrate. To identify the lactic acid, the contents of the retort are evaporated with zinc oxide and filtered while hot; zinc lactate crystallises on cooling. A few centigrammes of the zinc lactate are mixed with phosphoric acid and extracted with ether. The ethereal solution is evaporated, and a little cobalt acetate and lead acetate are added. A precipitate is obtained of cobalt lead lactate in the form of colourless, hexagonal plates which are feebly lævorotatory.

Estimation of Tannin. A. Heinemann. (*Zeitschr. angew. Chem.*, 1899, 245–253). The author has investigated the merits of the gravimetric and volumetric methods for the estimation of tannin and decides in favour of the gravimetric process. He recommends the following modification of the latter:—To 100 c.c. of the solution, which should contain from 1–1·5 grammes of tannin, 3 grammes of prepared hide-powder are added, and the mixture is left for 14–16 hours, being shaken frequently. The liquid is then filtered through paper; the filtrate ought not to give a precipitate either with gelatin solution (1 gramme of gelatin, 100 c.c. of water, and 1 c.c. of phenol), or with tannin. A definite portion of the filtrate is now evaporated to dryness, and the weight of the non-tannin solids thus obtained deducted from that of the residue left by the infusion before treatment with hide-powder. The hide-powder is prepared as follows:—The commercial product is treated 8 times with 20 times its bulk of water, thrown on a cloth filter, and well pressed; it is then treated with 10 times its amount of alcohol, again collected and pressed, then dried at 100°, and powdered.

The hide-powder process, as described, is found to give more satisfactory results than the "silk process" recommended by Vignon (see *Year-Book of Pharmacy*, 1899, 109).

Estimation of Salicylic Acid. W. Fresenius and L. Grünhut. (*Journ. Chem. Soc.*, from *Zeitschr. für analyt. Chem.*, xxxviii. 292–301.) The authors have submitted to a critical investigation three methods of estimating salicylic acid, namely:—(1) extraction with volatile solvents and weighing the residue from the evaporated extract; (2) an iodimetric process; (3) Freyer's bromine absorption method. The last alone gave satisfactory results. The first method failed in consequence of the volatility of salicylic acid, it being found impossible to expel the solvent

(chloroform, ether, or light petroleum and ether) completely, either at 100° or at a lower temperature, without serious loss of salicylic acid. The second method gave very uncertain results, and the authors were unable to confirm the statement of Messinger and Vortmann that 1 mol. of salicylic acid consumes 6 atoms of iodine. The bromination method proceeds in accordance with the equations, $C_6H_4 \cdot OH \cdot COOH + 8Br = C_6HBr_3 \cdot OBr + 4HBr + CO_2$, and $C_6HBr_3 \cdot OBr + 2KI = C_6HBr_3 \cdot OK + KBr + I_2$, so that ultimately 6 atoms of halogen are consumed by 1 molecule of salicylic acid. At least 75 per cent. excess of bromine (in the form of an acidified mixture of bromate and bromide) must be used, and stronger solutions than were employed by Freyer are advisable. For 0·2 gramme of sodium salicylate, there should be taken 100 c.c. of a solution containing 3 grammes of sodium bromate and 20 grammes of sodium bromide per litre. This, diluted with 300 c.c. of water, is first acidified with 30 c.c. of hydrochloric acid of sp. gr. 1·1. The 1 per cent. solution of the salicylate is then added with stirring, and after waiting for 5 minutes 30–40 c.c. of 10 per cent. potassium iodide solution are added and the free iodine titrated by thiosulphate. It is important not to add starch paste until the liquid is nearly decolorised. To estimate salicylic acid in presence of starch, it is necessary to separate the latter by dissolving in 90 per cent. alcohol and to employ an aliquot part of the filtered solution.

Detection of Salicylic Acid in Milk. G. Breustedt. (*Archiv. der Pharm.*, ccxxxvii. 170–172.) 10 c.c. of the milk are heated with 10 c.c. of fuming hydrochloric acid until a red coloration appears. After cooling, the mixture is agitated with 20 c.c. of ether, the ethereal solution evaporated, the residue shaken with a little hot water, the solution filtered, and the salicylic acid detected in the filtrate by the addition of ferric chloride.

Estimation of Fat in Milk. M. Kühn. (*Chem. Centr.*, 1899, 388–389.) Soxhlet's process, in which the amount of fat is deduced from the difference in the specific gravity of water-saturated ether before and after agitation with slightly alkalized milk, gives satisfactory results, provided the hydrometers employed are accurate, and the ether is again shaken with water in order to free it from any alcohol which may have formed in it on keeping.

Analysis of Condensed Milk. F. S. Hyde. (*Journ. Amer. Chem. Soc.*, xxi. 439–444. From *Journ. Chem. Soc.*) The whole contents of a tin of the milk are mixed until of the same consistency throughout and a stock solution is prepared by mixing 25 grammes of the milk with 75 grammes of water. The total solids are

found by evaporating five grammes of the solution and drying the residue at 100°. The percentage of fat is obtained by absorbing a known weight of the solution by an Adams' coil, which is dried and extracted with ether in a Soxhlet apparatus. The milk sugar is determined by titration with Fehling's solution. The cane sugar is obtained by boiling the stock solution with citric acid, which inverts the cane sugar but not the milk sugar; the solution is cooled, neutralised with potassium hydrate solution made up to a known volume, and titrated with Fehling's solution. The reduction corresponds with a certain amount of cane sugar from which must be subtracted the milk sugar in terms of cane sugar. The proportion of milk solids is found by deducting the cane sugar from the total solids, and the percentage of water by subtracting the percentage of total solids from 100. The difference between the milk solids and the sum of milk sugar and fat represents casein, albumin, and salts. The ash is obtained in the usual way by ignition of the total solids.

Alcohol in Milk. A. Peterman. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 73.) The author has examined the milk of cows fed on distiller's swill and found that the popular belief that milk from cows thus fed contains alcohol is erroneous, since in no sample did he find the slightest trace of alcohol.

Detection of Cane Sugar in Sugar of Milk. M. Landin. (*Chem. Zeit.*, 1900, 211.) The sample to be tested is treated with concentrated sulphuric acid; in the absence of cane sugar it will assume a very pale yellow coloration changing gradually to a light brownish red, while the acid itself also becomes slightly coloured. In the presence of cane sugar, however, the sample will turn dark very rapidly, eventually becoming dark brown or brownish black, while the acid itself will show a similarly dark colour. If the cane sugar amounts to a larger proportion, both the sample and the supernatant acid will develop a black colour.

The Testing of Butter. A. Zega. (*Chem. Zeit.*, xxiii. 312. From *Journ. Chem. Soc.*) Butter is melted and filtered, and some of the fat is put into a test-tube and heated for 2 minutes in the boiling water-bath. One c.c. is drawn off with a small pipette previously heated and put into a glass-stoppered cylinder containing 20 c.c. of a mixture of 6 parts of ether, 4 parts of alcohol, and 1 part of glacial acetic acid. The cylinder is placed in water at 15–18°, when, if the sample is pure, the liquid remains clear or only deposits an inappreciable amount of fatty matter. With butter containing 10 per cent. or more of margarine, however, a

more or less abundant deposit is obtained which may be examined microscopically. Drawings are given showing the considerable differences in appearance between the deposits from butter and from margarine. The process is also serviceable for the detection of tallow in lard; drawings of deposits from lard and tallow being also given.

Detection of Quassia as a Substitute for Hops in Beer. A. C. Chapman. (*Analyst*, xxv. 35–37.) Hop bitter yields valeric acid when oxidised with an alkaline solution of potassium permanganate. Hence the entire substitution of quassia for hops in beverages may be recognised by a process based on the different behaviour referred to. The beer is evaporated to dryness with some sand; the mass is then dried in an air-bath, powdered and extracted with ether. The ether is filtered into a flask, and after recovering the bulk by distillation, the last traces are driven off by warming the flask on the water bath. A solution containing 40 grammes of potassium permanganate and 10 grammes of potassium hydrate per litre is now added in small portions until the permanganate ceases to be readily reduced; warming and shaking promote the action. The excess of permanganate is then reduced by adding a sufficiency of oxalic acid, and the filtered liquid evaporated in a glass dish. If the residue is now moistened with dilute sulphuric acid, the odour of valeric acid will at once become apparent if hop bitter is present; in the case of quassia, a faint odour of acetic acid will be noticed.

Detection of Saccharin in Foods. A. Hasterlik. (*Chem. Zeit.*, xxiii. 267–268.) Börnstein's resorcinol test is found to be worthless, as the green fluorescence is often obtained with this reagent in testing beverages containing no "saccharin" whatever. The coloration in such cases is attributable to succinic acid, traces of which always occur in fermented liquids.

Detection and Estimation of Saccharin in Wine. D. Vitali. (*Chem. Centr.*, 1899, 1297.) For the detection of small quantities of saccharin in wine, etc., the best results are obtained with the Allen-Reischauer reaction, which is based on the conversion of the sulphur contained in that substance into sulphuric acid. Small quantities of saccharin may be quantitatively determined by treating the residue from the evaporation of the wine with mercuric nitrate, drying and weighing the precipitated mercury saccharinate $(C_6H_4 : CO SO_2 : N)_2Hg$, and decomposing this with sulphuretted hydrogen. The quantity of saccharin in the sample

is deduced from the difference in weight of the mercury sulphide and the mercury saccharinate.

Detection of Saccharin in Foods. R. Truchon. (*Ann. Chim. Anal. Appl.*, v. 48. From *Journ. Soc. Chem. Ind.*) The author gives the following modification of Schmitt's method, which is used in the municipal laboratory of Paris:—At least 200 c.c. of liquid, after acidifying with phosphoric acid, are extracted three times with 35–40 c.c. of a mixture of equal parts of ether and petroleum spirit. The extract is washed with water, evaporated in a platinum dish, 5–6 drops of a solution of pure caustic soda are added, and the mass is carefully brought to quiet fusion over a small Bunsen flame. The end of the reaction is indicated by the disappearance of the small gas bubbles. The mass is extracted with distilled water, the solution acidified with sulphuric acid, extracted twice in succession with 30 c.c. of petroleum spirit, filtered, evaporated in a porcelain dish, and a drop of a very dilute (1 : 10,000) solution of iron chloride added. If saccharin was originally present, the well-known violet coloration is produced by the salicylic acid formed from the saccharin.

Assay of Saccharin. E. Reid. (*Amer. Chem. Journ.*, xxi. [6], 461.) Remsen and Burton have shown that *o*-benzoyl sulphonic imide, when boiled with dilute acids, passes through *o*-sulphamine benzoic acid into the acid ammonium salt of *o*-sulphobenzoic acid, whilst *p*-sulphamine benzoic acid is not affected. The author's assay process is based upon the determination of ammonia in the ammonium salt thus formed, and he prefers the use of hydrochloric acid for the reaction just referred to, as he finds that the use of sulphuric acid, suggested by Hefelmann, is not altogether without action on *p*-sulphamine benzoic acid. Dilute hydrochloric acid has no such action, and hence yields more satisfactory results. The process is conducted as follows:—0·650 gramme of "saccharin" is weighed out into a 100 c.c. flask, and 50 c.c. of dilute hydrochloric acid are added (120 c.c. pure concentrated H Cl in 1 litre). The flask is fitted with a cork, through which a glass tube passes, 8 mm. wide and 45 cm. long. After two hours' gentle boiling on a sand-bath, the stopper is removed, and the solution allowed to evaporate to about 10 c.c. After diluting, the contents are washed out into an ordinary distilling flask. 20 c.c. of a caustic solution (equal to 10 grammes of Na O H) are added, the ammonia is distilled off into standard acid, and the excess titrated back with K O H, cochineal being the indicator. To cause the caustic soda solutions to boil evenly, steam is passed into the

distilling flask from another flask containing water, a little potassium bichromate and sulphuric acid.

Detection of Antifebrin, Phenacetin, and Exalgin in Antipyrine. P. N. Raikow and P. Schtarbanow. (*Oesterr. Chem. Zeit.*, iii. 125–127. From *Journ. Chem. Soc.*) By boiling with phosphoric acid of sp. gr. 1·7, in which these substances are soluble, the anilides antifebrin and phenacetin are hydrolysed and yield acetic acid free from bye-products, so that very small quantities may be recognised. Antipyrine colours the phosphoric acid golden-yellow, which gradually becomes darker and brownish-yellow. Antifebrin gives a pale yellow colour, turning brown on prolonged boiling. Phenacetin causes first a rose, then a brownish-red coloration, passing from reddish-violet, through violet and bluish-green into dirty green. The appearance of the violet colour is particularly characteristic for phenacetin.

Antifebrin and phenacetin are distinguished by their behaviour towards potassium hydrate. A few grammes of the substances are heated with 2–4 c.c. of strong aqueous potash in a test-tube closed by a perforated india-rubber cork, through which passes a bent tube dipping into another test-tube containing 1 to 3 c.c. of a clear solution of bleaching powder. In the presence of antifebrin, the first drops which distil over cause the well known violet colour due to aniline. In the absence of antifebrin and the presence of phenacetin, the first drops cause no colour, but those following give a vermilion-red turbidity, due to phenetidin; finally, an amorphous, red substance separates on the surface of the liquid, which becomes clear yellow after some time. If the test-tube is changed, both the reactions, the violet colour and the separation of phenetidin may be noticed in succession. When boiling a mixture of phenacetin and antipyrine with potassium hydrate, the distillate does not give with bleaching powder the characteristic red coloration for phenacetin, but the solution turns first yellowish-green and then yellowish-grey, whilst with antipyrine alone it remains colourless.

Exalgin readily evolves acetic acid when boiled with phosphoric acid, and the liquid turns golden-yellow. The separated methylaniline distils in oily drops, which collect on the surface of the bleaching powder solution, and soon become green, then greyish-green, and finally dirty brown. Contrary to Fischer's statement, exalgin is easily hydrolysable by caustic alkalies.

Traces of *p*-aminophenol may be detected in phenacetin, antifebrin, etc., by the intense red colour developed when dissolving

these substances in cold phosphoric acid. When pure, they dissolve to a colourless liquid.

The Volumetric Estimation of Alkaloids by Titration with Acids. E. Falières. (*Comptes Rendus*, cxxix. 110.) The author employs an ammoniacal solution of copper as indicator; the exact point of neutralisation is then rendered evident, not by a colour change, such as is often difficult to discern in these cases, but by the precipitation of copper oxide, which is observed with great ease. He has obtained excellent results in this manner in the titration of sparteine, morphine, codeine, cinchonine, cinchonidine, quinidine, strychnine, brucine, atropine, veratrine, and coniine. The copper solution is prepared by dissolving 10 grammes of copper sulphate in about 500 c.c. of water, adding ammonia until the precipitate first formed is nearly all dissolved, filtering, and diluting to a litre. This solution is titrated by means of decinormal sulphuric acid. For an estimation, 0·1 gramme of the alkaloid is dissolved in 20 c.c. of decinormal sulphuric acid, the flask placed on a black surface, and the ammoniacal copper solution added until there is a persistent turbidity in the liquid. The volume of copper solution used corresponds with the amount of sulphuric acid uncombined with the alkaloid, and, from this the amount of acid combined with the alkaloid is readily calculated.

In estimating the total alkaloids in cinchona bark by this method, there is no necessity for removing colouring matters or other impurities before the titration, since these do not interfere with the formation and distinct observation of the copper oxide precipitate.

Quantitative Estimation of Alkaloids by means of Standardised Iodine Solution. C. Kippenberger. (*Archiv. der Pharm.*, ccxxxviii. 135–148.) The author has extended his method to the determination of caffeine and aconitine, and describes the results obtained. He discusses the objections of Scholtz to the method, and considers them refuted by the facts given in the present communication, but admits that the volumetric estimation of alkaloids in the form of their iodine compounds cannot be regarded as one of the best analytical methods.

A Colour Reaction of Nicotine. I. Schindelmeiser. (*Pharm. Centralh.*, xl. 703.) A trace of the alkaloid is treated with a drop of 30 per cent. formaldehyde solution, free from formic acid, and allowed to stand for several hours, when, on the addition of a drop of nitric acid, the solution is coloured crimson; if from 0·005

to 0·01 gramme of nicotine be taken, the colour is dark red. The amount of formaldehyde indicated should not be exceeded, as, with an excess, the solution becomes green, and the addition of nitric acid causes energetic decomposition; nor should the mixture of nicotine and formaldehyde be heated. As little as 0·0005 gramme of nicotine can be identified by means of this test. Neither coniine, piperidine, trimethylamine, pyridine, chinoline, picoline, nor aniline give the reaction.

Test for Veratrine. I. L. Kondakoff. (*Chem. Zeit.*, xxiii., 4.) The author confirms Kunz-Krause's statement that when veratrine is evaporated with fuming nitric acid and the residue treated with alcoholic potash, the mixture turns blood-red and evolves a strong odour of coniine.

Colour Reactions of Morphine and its Derivatives. R. Kobert. (*Chem. Centr.*, 1899, ii. 149–150.) A small quantity of the powdered alkaloid is added to a mixture of 3 c.c. of strong sulphuric acid and 3 drops of formaldehyde solution in a porcelain dish. *Morphine* gives at first a purple-red, passing through violet to almost pure blue; if partially protected from the air by placing in a test-tube, the blue colour remains for a long time. *Dionin* gives a deep blue, *codeine* a violet, *heroine* a reddish-violet turning to bluish-violet, *peronine*, a permanent reddish-violet, *methylphenomorpholine* an intense red.

A Delicate Test for Caffeine. A. Archetti. (*Chem. Centr.*, 1899, ii. 453.) A solution of potassium ferricyanide is heated to the boiling point with half its volume of nitric acid, and the aqueous caffeine solution added to the mixture. A precipitate of Prussian blue is thus formed. The reaction also takes place with uric acid and xanthine bases, but with these it is much less delicate.

Melzer's Picrotoxin Reaction. H. Kreis. (*Chem. Zeitung*, xxiii. 21–22.) Cholesterol and phytosterol are found by the author to give reactions with benzaldehyde and sulphuric acid very similar to that described by Melzer as characteristic for picrotoxin. Care should therefore be taken in forensic investigations to avoid erroneous conclusions with regard to this reaction.

The Estimation of Phenol. E. Riegler. (*Chemist and Druggist*, lvi. 442.) The author describes the following new method for the estimation of carbolic acid or other allied phenols. In alkaline solution phenol and para-diazonitraniline yield a red

diazo derivative insoluble in water, according to the following equation :—

$$C_6H_4NO_2.N.NCl + C_6H_5OH + 2NaOH$$
$$= NaCl + 2H_2O + C_6H_4NO_2N:NC_6H_4ONa.$$

If dilute sulphuric acid be added by drop until the reaction is strongly acid, the free phenol derivative

$$C_6H_4NO_2.N:N.C_6H_4OH$$

separates as a yellow body insoluble in water. To carry out this process quantitatively 50 c.c. of the solution of phenol, containing at most 0·2 per cent., are mixed with 10 c.c. of a 5 per cent solution of Na_2CO_3, and 20 c.c. of saturated solution of the diazo body are added. Then, with constant shaking, 20 per cent. sulphuric acid is added until the solution is distinctly acid. After two or three hours the precipitate is collected on a tared filter and washed free from acid with water, and dried at 100°. A small correction of 0·0002 gramme per 100 c.c. of liquid is added to compensate for the solubility of the compound. Other phenols and phenol ethers can be estimated with accuracy in this manner.

Analysis of Commercial Phenols. S. B. Schryver. (*Journ. Soc. Chem. Ind.*, 1899, xviii. 553–556.) The process is based on the fact that phenol and its homologues (1 mol.), when acting on sodamide, liberate ammonia (1 mol.). About 1 gramme of finely-powdered sodamide is washed a few times by decantation with small quantities of benzene, and then introduced into a 200 c.c. distilling flask fitted with a separating funnel and with an inverted condenser in connection with an apparatus for absorbing ammonia, and this in turn with an aspirator. About 60 c.c. of benzene are introduced into the flask, and this is boiled on the water-bath for 10 minutes, a slow current of dry air, free from carbonic anhydride, being drawn through in order to free the apparatus and contents from ammonia. 20 c.c. of *N* sulphuric acid are then placed in the absorption apparatus, and the solution of the phenol in pure benzene (freed from any moisture by prolonged contact with fused sodium acetate) is then introduced into the distilling flask and the boiling continued ; the ammonia evolved is absorbed by the standard sulphuric acid, the excess of which is then titrated with sodium carbonate, using methyl-orange as indicator.

The method may be successfully employed for the estimation of phenols in essential oils, such as guaiacol in wood tar, thymol in oil of thyme, and eugenol in oil of cloves. If the total weight

of two phenols is known, their respective amounts may be approximately calculated from the amount of ammonia evolved.

Water in phenols may be estimated by making two experiments, one before, and one after drying; the difference in ammonia represents moisture.

Analysis of Soap. A. A. Shukoff and K. T. Nogin. (*Chem. Rev. Fett.-Harz-Ind.*, vi. 205–207. From *Journ. Chem. Soc.*) 4–5 grammes of the sample, taken from the centre by means of a cork borer, are quickly weighed in a beaker and gently warmed with 30 c.c. of normal sulphuric acid until the fatty acids are perfectly liquefied. When cold, the aqueous liquid is filtered, and the fatty acids again melted, and treated with 30 c.c. of water, which is afterwards poured through the same filter. The cake is washed thrice with cold water, and then dissolved in alcohol; the solution is evaporated in a weighed dish, and the residue dried for 20 hours at 95–100°. The molecular weight of the acids is then found by dissolving them in 10 c.c. of alcohol, and titrating with normal sodium hydrate. The acid filtrate is also titrated, and the loss in sulphuric acid represents the total alkali; the difference between this and the alkali required by the fatty acids represents free alkali.

Analysis of India-Rubber. R. Henriques. (*Journ. Soc. Chem. Ind.*, xix. 177.) *Preparation of Average Sample.*—The difficulties of india-rubber analysis begin at this stage, because the manufactured articles are scarcely ever of uniform composition throughout. Fairly large quantities of the samples should be brought to as fine a state of subdivision as possible, either by cutting, rasping, or grinding.

Determination of Residue on Ignition (Ash).—From 0·5 to 1 gramme of the sample is slowly ignited in a dish of 5 cm. diameter. The mineral residue thus obtained, may not represent the total inorganic matter present, owing to volatilisation of any mercury compounds present, decomposition of carbonates and sulphates, and conversion of oxides into sulphides; nevertheless, the knowledge of its amount is required for determining the rubber substitute later on. This ash should also be examined qualitatively. Its solubility in acids, the composition of this solution, and also that of the insoluble residue, are then determined according to well-known methods.

Estimation of Total Sulphur and Inorganic Constituents.—The determination of total sulphur is carried out in the manner described in *Journ. Soc. Chem. Ind.*, 1899, 950. The insoluble

mineral residue thus obtained is analysed in the usual way. In red articles, mercury should specially be tested for in a fresh quantity of the sample, and if any be present it should be quantitatively determined.

Carbonic Acid Estimation.—The carbonates of calcium, lead, zinc, and magnesia frequently occur in manufactured india-rubber. The direct estimation of the carbonic acid present is carried out in the Geissler flask, 1 gramme of the sample being taken, and treated with dilute hydrochloric acid, in which a small quantity of cupric sulphate has been dissolved. The latter retains any sulphuretted hydrogen which is evolved, should the sample contain sulphides. The method only gives accurate results if the sample be used in the state of fine powder. Cuttings do not answer, as the acid cannot penetrate them. It is best to treat the sample first according to Weber's nitrobenzene method, when the mineral constituents will be obtained almost free from organic substances. An aliquot part of these mineral constituents is then used for the determination of the carbonic acid as above described.

Metals present as Sulphides and Sulphates.—The inorganic sulphides present are estimated by boiling the mineral constituents, isolated as already specified, with hydrochloric acid, filtering, washing with water, and determining the sulphur in the insoluble residue. The difference between the total sulphur in the mineral constituents and the sulphur present in the insoluble residue represents that present in the form of sulphides. Sulphur present as sulphates is determined in the usual manner in the insoluble residue.

Rubber Substitutes soluble in Alkali.—From 5 to 6 grammes of the sample are boiled with about 30 c.c. of alcoholic caustic soda (6 to 8 per cent.) for four hours in connection with a reflux condenser. The alcohol is then evaporated and the residue treated with hot water, filtered, and washed till the washings are neutral, with hot water. The residue on the filter is then transferred to a watch glass and dried at 100° C. until its weight is constant. In this treatment with alcoholic caustic soda, not only the rubber substitutes, but also fatty oils, small quantities of resinous bodies contained in the rubber substance, and possibly also antimony sulphide, zinc oxide, and gypsum are dissolved. In order, therefore, to calculate the amount of rubber substitute present in a sample, from the loss in weight observed after this treatment, the ash in the treated sample must again be determined. From the amounts of total sulphur, total ash, amount of substance insoluble in caustic soda,

and the percentages of sulphur and ash in this substance, the corresponding amounts of india-rubber and sulphur present, can then be readily calculated.

Asphaltum and Pitch.—1 gramme of the sample from which the substitutes, free sulphur and oils have already been extracted, is treated for one hour with 30 c.c. of nitrobenzene at the ordinary temperature. The whole is then transferred to a filter, pressed with a pestle, and washed with another 30 c.c. of nitrobenzene. Finally the residue on the filter is washed with ether until free from nitrobenzene, dried, and weighed. The loss in weight is due to asphaltum, or pitch.

Valuation of Indigo. W. Holtschmidt. (*Zeitschr. für angew. Chem.*, 1899, 451–455, and 475–479. From *Journ. Chem. Soc.*) The assay of indigo by the present processes is not satisfactory. In the process of titration with permanganate, a serious error may be caused by secondary actions when the sample of indigo is treated with sulphuric acid (sulphonated) at 85° ; but this may be avoided by adopting the author's cold process. 0·5–1 gramme of the finely-powdered sample is treated in a test-tube with 10 c.c. of sulphuric acid, containing 40 per cent. of phosphoric anhydride, and the mixture well kneaded with a glass rod ; the sulphonation is complete in about two hours, but it is safer to leave the mixture overnight in a desiccator. The solution is now poured into a measuring flask containing enough water to prevent any sensible development of heat, the tube is well rinsed with cold water, and the whole finally made up to 500 or 1000 c.c., filtered quickly, and 25 c.c. of the filtrate titrated with centinormal permanganate as follows : After diluting to about 125 c.c., the permanganate is added at the rate of 2 drops per second until the liquid is of a pale green colour, whilst on stirring, dark clouds are visible ; 2 or 4 drops of the permanganate are now added at a time with gentle stirring, so as not to disturb the clouds, and the formation of fresh clouds is noticed. When no more are formed the operation is finished, and 0·1 or 0·2 c.c., of permanganate is deducted from the total. A paraffin lamp may be used as the source of light for the titration. Donath and Strasser's improvement in the titration process is approved of by the author. This consists in freeing the sample from indigo-glue and indigo-red by successively digesting with dilute hydrochloric acid and alcohol-ether mixture before sulphonating. The presence of indigo-brown does not interfere with the subsequent titration with permanganate.

Voeller proposed to remove the indigo-brown also by treating the

sample already freed from indigo-glue and indigo-red with dilute aqueous potash, and then to estimate the nitrogen in the purified indigotin by Kjeldahl's process. The author approves of this method, but recommends the use of a 1 per cent. solution of potassium hydrate; too long contact with the alkali must be avoided, as otherwise indigo-brown is actually generated from the indigotin. A large number of analyses have been made and tabulated, showing the amount of nitrogenous matter extracted by the various solvents in use to purify the sample before submitting it to the Kjeldahl process. For convenience of comparison, the nitrogen due to the "glue" has been multiplied by the same factor as the other nitrogen.

Part of the paper is devoted to the technical testing of indigo by the colorimetric method, which, however, often fails to give exact indications owing to differences in shade, and to the "wool test," which, although valuable to dyers, gives no indication of the true amount of indigotin.

Assay of Java Indigo. C. Rawson. (*Journ. Soc. Chem. Ind.*, xviii. 251.) The presence of a yellow colouring matter, sometimes to the extent of 20 per cent., has recently been noticed in samples of Java indigo, and the presence of this substance interferes with the ordinary method of analysis, as it behaves in many respects like indigotin. It may be detected by adding aqueous soda or ammonia to powdered indigo placed in a porcelain basin, when the alkali will assume a deep yellow colour. It may be removed by boiling with dilute ammonia, or preferably with alcohol, which also dissolves any indirubin, and the insoluble matter is then sulphonated as usual, and titrated for indigotin. Indirubin may be estimated as follows: 0·1–0·25 gramme of the sample is boiled with 150 c.c. of ether, in a reflux apparatus; when cold, the liquid is made up to 200 c.c., and shaken with 10 c.c. of water; this causes the undissolved matter to settle completely. A measured quantity of the liquid is now withdrawn and compared in a colorimeter with a standard solution of indirubin.

Perezol, a new Indicator. M. Duyk. (*Pharm. Journ.*, 4th series, ix. 621, from *Annales de Chim. Analyt. Appl.*, iv., 372.) Under the name of perezol, the author suggests the use of pipitzahoic acid, derived from *Perezia adnata*, a common Mexican plant. The acid occurs in the rhizomes of the plant, from which it is easily extracted by toluene or benzene. From these solvents it is deposited, on evaporation, in orange yellow crystals, which are purified by recrystallisation. The yield is about 5 per cent. As

an indicator a 0·5 per cent. alcoholic solution is recommended. This is extremely delicate towards alkalies, both fixed and volatile, giving a mauve rose tint with the slightest trace of free alkali; the action is very sharp, even in extreme dilution. Thus, distilled water, boiled in a glass vessel, will give a distinct reaction, from the trace of alkali dissolved from the glass. In ordinary drinking water, the alkaline-earthy carbonates present give a marked reaction; so does saliva. Alkaloids react with perezol with great delicacy, rendering it valuable for the titration of those bodies by the alkalimetric method. Perezol, sensitised by the addition of the faintest trace of alkali, is immediately decolorised by free acids; carbonic acid, and organic acids, react in this way like the mineral acids. Boric acid, however, acts as a base towards the indicator, except in the presence of glycerin, when it has an acid reaction. Borates, acetates, carbonates, and bicarbonates have an alkaline reaction; ammoniacal salts are neutral towards it.

MATERIA MEDICA AND PHARMACY.

PART II.

MATERIA MEDICA AND PHARMACY.

Asparagus as a Therapeutic Agent. H. A. Hare. (*Therap. Gaz.*, xxiii. 589.) The well-known diuretic properties of asparagus have induced the author to try the effects of a fluid extract of the root stalks. He finds that such a preparation, given in 1 drachm doses three times a day, produce very marked diuresis, and is quite free from injurious action.

Emetic Properties of Melon Root. M. Heberger. (*L'Union Pharm.*, xl. 304.) The root of the melon possesses emetic properties similar to those of ipecacuanha. The plant seems to be more active in the wild than in the cultivated state. The author has extracted from the root a bitter substance possessing both purgative and emetic properties, and producing an emetic action in doses of $7\frac{1}{2}$ to 10 grains.

Constituents of Rhubarb. O. Hesse. (*Liebig's Annalen*, cccix. 32. From *Journ. Chem. Soc.*) By a method of treatment which is fully described in the original paper, Chinese rhubarb yields chrysophanic acid, emodin, rhabarberone, and rhein.

Chrysophanic acid, $C_{15}H_{10}O_4$, crystallises from benzene, alcohol, or glacial acetic acid in yellow leaflets, and melts at 186–188°; the substance has been previously described as melting at different temperatures between 154° and the true point of fusion, the presence of varying amounts of methylchrysophanic acid being the cause of the uncertainty. It dissolves in 1989 parts of absolute alcohol at 15°, and the solution develops a dark reddish-brown coloration with ferric chloride, becoming cherry-red with bleaching powder. A cherry-red precipitate of the *barium hydrate* derivative, $C_{15}H_{10}O_4$, $Ba(OH)_2 + H_2O$, is obtained on adding aqueous barium hydrate to a dilute solution in alcohol. The *acetyl* derivative crystallises from glacial acetic acid in yellow needles, and melts at 152°; the alcoholic solution develops a brownish-red coloration with ferric chloride, and becomes red when treated with

caustic potash. Chrysophanic acid dissolves less readily in ammonia than Liebermann represents; the product of the action of the cold alkali is aminochrysophanic acid.

Rhabarberone, $C_{15}H_{10}O_5$, crystallises from alcohol in yellow leaflets, and melts at 212°; the alcoholic solution develops a brownish-red coloration with ferric chloride, and an aqueous solution of alkali carbonate dissolves the substance, developing a purple coloration. Hydriodic acid converts it into *rhabarberohydroanthrone*, $C_{15}H_{12}O_4$, without eliminating methyl iodide; it crystallises in yellow leaflets, and fuses to a black mass at 215–220°.

Rhein, $C_{15}H_{10}O_6$, melts at 262–265°, and when dissolved in alcohol develops an intense reddish-brown coloration with ferric chloride; acetic anhydride converts it into the *diacetyl* derivative, $C_{15}H_8O_4(OAc)_2$.

Austrian rhubarb contains chrysophanic acid, contaminated as usual with methylchrysophanic acid, and *rhapontin*, $C_{22}H_{24}O_9$, which crystallises from water in yellowish prisms, and melts, decomposing at 235°. Rhapontin is indifferent towards ferric chloride, and is neutral to litmus, but the aqueous solution becomes acid when boiled; it contains one methoxyl group, dissolves readily in alkalies and alkali carbonates, and forms the *lead* derivative, $C_{21}H_{20}O_9Pb_2$. The *tetracetyl* derivative melts at 102°. Rhapontin also occurs in English rhubarb, and the chrysophanic acid derived from this source melts at 188°, and contains only a small proportion of methylchrysophanic acid.

Rumex Nepalensis and R. Palustris. O. Hesse. (*Liebig's Annalen*, cccix. 60.) The author has previously stated that the root of *Rumex nepalensis* yields rumicin, nepalin, and nepodin, of which the first-named had the empirical formula of chrysophanic acid. It now transpires that rumicin is chrysophanic acid, uncontaminated with methylchrysophanic acid, whilst nepalin is identical with nepodin, $C_{18}H_{16}O_4$.

The root of *Rumex palustris* contains chrysophanic acid and nepodin, which are also present in *Rumex obtusifolius*, along with *lapodin*, $C_{18}H_{16}O_5$, which crystallises from alcohol in yellow needles, and melts at 206°, when it decomposes. An alcoholic solution of lapodin develops a dark brown or greenish-brown coloration with ferric chloride, and hydriodic acid does not eliminate a methyl group.

Constituents of Aralia Nudicaulis. W. C. Alpers. (*Amer. Journ. Pharm.*, August, 1899 370–378.) The fresh root of *Aralia*

nudicaulis contains 40–60 per cent. of water, and the dry drug yields on an average 5·53 per cent. of ash, which contains about 1·38 per cent. of sodium and potassium chlorides and sulphates. The dark red, fatty oil, obtained by extraction, has a sp. gr. of 0·921 at 20°, is soluble in light petroleum, benzene, ether, or chloroform, slightly so in absolute alcohol, and insoluble in water; it solidifies at 3°, has acid number 7·3, saponification number 192, iodine number 106, and molecular weight of about 900; it consists chiefly of triolein. About 0·12 per cent. of an oil is obtained by distilling finely powdered aralia with steam; it has a pleasant, aromatic odour, and is composed mainly of a sesquiterpene, *araliene*, $C_{15}H_{14}$, which boils at 270°, has a sp. gr. of 0·9086 at 20°, a specific rotatory power $[\alpha]_D$ –7 to –8°, and a refractive index n_D 1·49936. It combines with hydrogen chloride to form an oily hydrochloride, but does not yield a solid bromide by the action of bromine. With a solution of hydrogen chloride in glacial acetic acid, it forms a bluish compound. The ethereal oil also contains a small quantity of a sesquiterpene alcohol, and a little azulin, $C_{16}H_{26}O$, which boils at about 300°.

Structure of Gelsemium. C. B. Thompson. (*Amer. Journ. Pharm.*, 1899, 422. From *Pharm. Journ.*) The author has made a histological study of *Gelsemium sempervirens*, and finds that the internal phloem arises primarily as four longitudinal strands, which are an integral part of the leaf trace bundles. Its origin is simultaneous with, or slightly later than, the protoxylem and external phloem, so that the leaf trace bundles are bicollateral from the first. The patches formed by the internal phloem—two of which arise just below the cotyledonary node and the other two just below the node bearing the first pair of leaves—are bounded internally by a two-celled phloem sheath, and they grow centrifugally by means of a medullary cambium, the inner and older layers in time becoming crushed and obliterated. The pith dies early in the first year of the plant's growth, and the cavity is subsequently filled up with internal phloem. Where that phloem runs into the petiole it constitutes at first a bicollateral bundle system, but at the base of the petiole it descends through the xylem as two strands, and from that point upwards the primitive collateral bundle system prevails. No internal phloem occurs in the root, in the lower portion of the hypocotyl, nor in the cotyledons. In the root cortex a copious fungoid growth is found, and absorption of starch usually results in cells being occupied by the fungus. In conclusion, it is stated that internal phloem is an

acquired characteristic of the plant, and has probably been developed in the long and sometimes twisted stems, to supplement the external phloem. The material used in the investigation consisted of specimens of varying age, preserved in alcohol, and of fresh seedlings grown in hothouses.

Hydrastis Canadensis. E. Collin. (*Chemist and Druggist*, lvi. 834.) The author reports upon adulterations of this drug with the rhizome of *Aristolochia serpentaria* and the roots of *Stylophorum diphyllum* and *Cypripedium parviflorum*. He gives a detailed description of the distinguishing features of these various drugs, and wood-cut illustrations of their structural appearance, for which the original paper should be referred to.

Iodometric Assay of the Root of Hydrastis Canadensis. H. M. Gordin and A. B. Prescott. (*Amer. Journ. Pharm.*, 1899, 518–522.) Ten grammes of the powdered root are stirred into a paste with a mixture of alcohol, concentrated ammonia, and ether (1 : 1 : 6 parts by volume), and allowed to remain in a well-closed vessel for several hours. The mixture is then dried, at first in a good draught and then over sulphuric acid under diminished pressure; the residue is transferred to a Soxhlet apparatus, being rinsed out with powdered barium nitrate, and the hydrastine is extracted completely with absolute ether; the ether is evaporated from the extract, and the residue dissolved in acidified water, and the solution diluted to 100 c.c. In a graduated 100 c.c. flask, 20–30 c.c. of a standard iodine solution (of about 1 per cent. strength) are placed, 20 c.c. of the filtered hydrastine solution run in, and the mixture is diluted to the mark and shaken until the pentiodide has all separated; the mixture is then filtered, and the excess of iodine determined by titrating 50 c.c. of the filtrate with standard sodium thiosulphate solution. Every 1 part of iodine used corresponds with 0·60403 part of hydrastine. Or the alkaloid may be estimated gravimetrically by shaking 20 c.c. of the filtered hydrastine solution with benzene and ammonia, removing the alkaloid from the benzene solution by shaking with acidified water, and then from the acid solution with ammonia and ether, the ethereal solution is finally evaporated in a dark place at the ordinary temperature, and the residue of hydrastine weighed.

The residue in the Soxhlet apparatus contains the berberine, which is not soluble in absolute ether; it is dried by passing a current of dry air through the apparatus, and is then extracted with alcohol. The alcohol is removed from the extract by heating

it with 200 c.c. of water on the water-bath; the residual liquid is acidified with acetic acid, cooled, and filtered into a conical flask; in this it is shaken for 10–15 minutes with 6–8 c.c. of acetone and enough 10 per cent. caustic soda solution to render the reaction alkaline, and set aside for 2–3 hours. The precipitated acetone compound is washed, and warmed in the same flask with 200–300 c.c. of very dilute sulphuric acid until it has all dissolved, the solution is poured into a long-necked Kjeldahl flask and boiled for 1½–2 hours; when cold, it is added to 100 c.c. of *N*/20 potassium iodide solution contained in a graduated 1000 c.c. flask, diluted to the mark, shaken, and left overnight. Then 500 c.c. are filtered from the precipitate of berberine hydriodide into another 1000 c.c. flask, treated with 50 c.c. *N*/20 silver nitrate and nitric acid, diluted to the mark, and filtered; the excess of silver is determined by titrating 500 c.c. of the filtrate with *N*/40 ammonium thiocyanate. The number of c.c. of the iodide solution used, multiplied by 0·167125, gives the percentage of berberine in the root.

Pareira Brava. M. Scholtz. (*Archiv der Pharm.*, ccxxxvii. 199–200.) The author finds that pelosine, the base obtained from this drug by extraction with acidified water and precipitation with sodium carbonate, is identical with berberine.

Allium Sativum in Pulmonary Tuberculosis. G. Cavazzani. (*Brit. Med. Journ.*, June 30th, 1900; *Epit.*, No. 499.) The author reports favourably on the action of garlic in the treatment of pulmonary tuberculosis, in which he has given it extensive trials. From 4 to 6 grammes of the desiccated bulb may be administered daily. It should be given in divided doses, and in such a form as to mask the taste. The administration is continued for a long time, but marked improvement in cases amenable to the treatment are manifested within the first month, sometimes within a few days. The author has tried it in every stage of the disease. Leaving aside some quite exceptional cases, all were improved by the garlic. In some the amelioration was so marked as to induce hope of a cure, every morbid symptom recognisable by the most careful examination having disappeared. This was more especially so in incipient cases or in the earlier stages of the disease. In all the cases reported upon, the clinical diagnosis was confirmed by the bacteriological examination of the sputum. The improvement begins with a diminution both in frequency and in quantity of the cough and expectoration within the first days of the treatment; often the sputum from muco-purulent becomes purely mucous on

the second or third day, probably by the antiseptic action of the volatile oils in the garlic. In favourable cases expectoration ceases altogether after a time. The physical signs are modified with greater or less rapidity according to the more or less advanced stage of the disease and the extent of the morbid process. The temperature often becomes normal, night sweats cease and the appetite almost invariably improves; weight is gained and sleep becomes regular. Hæmoptysis in all the cases observed had ceased without the use of any other remedy. The author has not found the garlic to cause any disturbance of digestion.

Constituents of Galanga Root. G. L. Ciamician and R. G. Silber. (*Ber. der deutsch. chem. Ges.*, 1899, 861–863.) The crystalline constituents of Galanga root have been investigated by Jahns, who isolated three compounds which were termed campheride, galangin, and alpinin. The first-named substance, which has the empirical formula $C_{16}H_{12}O_6$, crystallises from methyl alcohol in lustrous, golden needles a centimetre in length; it contains 1 mol. of the solvent, which is removed at 100°, and melts at 227–229°. The *triacetyl* derivative crystallises from alcohol in pale yellow needles, and melts at 193–195°. When the substance is heated with methyl alcohol, potassium hydrate, and methyl iodide, the *dimethoxymethyl* derivative is produced, along with two *compounds* melting at 154–155° and 138–140° respectively; the dimethoxymethyl derivative crystallises from methyl alcohol in rectangular plates and melts at 178°.

Notes on the Examination of Jalap Root during the Past Six Years. L. F. Kebler. (*Amer. Journ. Pharm.*, 1900, 298.) The author is in favour of fixing the standard with regard to the percentage of resin in jalap root at 10 per cent.

A large number of samples examined during the last six years show a variation from 17 per cent. of resin in 1894 to 1·87 per cent. in 1899. It seems that the jalap root supplied in the United States during that period has steadily and constantly diminished in the proportion of resin. Up to the last few years it was still possible to secure qualities yielding 12 per cent. of resin; but the difficulty of doing so seems to have increased ever since.

Ipecacuanha in Chronic Constipation. R. Blondel. (*Bull. gén. de Thérap.*, cxxxvii. 725.) The author has obtained excellent results with ipecacuanha in the treatment of chronic constipation. He administers it in the form of an enema, prepared by mixing a teaspoonful of a 20 per cent. aqueous solution of ipecacuanha

extract of the French Codex with 150 grammes of water. The injection should be retained for half an hour.

The Official Processes for the Assay of Ipecacuanha, Belladonna, and their Preparations. F. C. J. Bird. (*Pharm. Journ.*, 4th series, x. 175–178, 306–308, 334, 335, 414–416, 532–534, and 690–693.) In this elaborate report the author discusses the official processes and modifications thereof for the assay of ipecacuanha, belladonna, and their preparations. As the numerous observations and suggestions embodied in this paper cannot be adequately dealt with in the form of an abstract without losing much of their value, we confine ourselves in this place to directing the reader's attention to the report, and refer him to the sources above quoted.

Assay of Colchicum. H. M. Gordin and A. B. Prescott. (*Amer. Journ. Pharm.*, 1900, 297, 298.) After having tried a number of solvents, the authors found that extraction of the drug with hot alcohol for two hours completely removed the colchicine. The estimation of this principle was easily accomplished by saponification with standard alkali and titration with standard acid, phenolphthalein being used as indicator. This method of estimation is based on the fact that colchicine is an ethereal salt rather than an alkaloid.

Cascara Sagrada. M. Leprince. (*Comptes Rendus*, cxxix. 60, 61.) If cascara sagrada, the bark of *Rhamnus purshiana*, is extracted with 5 per cent. aqueous soda and the liquid acidified, a precipitate is obtained which consists chiefly of chrysarobin, chrysophanic acid, and emodin. Details of the separation and identification of these substances are given in the paper.

A New Constituent of Willow Bark. H. A. D. Jowett. (*Proc. Chem. Soc.*, xvi. No. 222.) The author examined a bark purchased as that of black willow, which could not be further identified than as some species of *Salix*, and found that the glucoside contained in it was not salicin but a new substance. On chemical examination it proved to be the glucoside of *m*-oxybenzaldehyde for which the name *salinigrin* is provisionally suggested. It is contained in the bark to the extent of about 1 per cent., and is a white, crystalline substance melting at 195°.

It is soluble in 52·2 parts of water and in 218·2 parts of alcohol at 15°, and is lævorotatory $[\alpha]_D^{15} = -87{\cdot}3°$. From salicin, it is sharply distinguished by yielding a colourless solution with sulphuric acid, salicin under similar conditions producing a blood-red

colour. Its formula is, $C_{13}H_{16}O_7$, and it splits up, on hydrolysis, into *d*-glucose and *m*-oxybenzaldehyde.

A New Constituent of Pomegranate Bark. A. Piccinini. (*Gazzetta*, xxix. [2], 311–318. From *Journ. Chem. Soc.*) From the light petroleum mother liquors obtained in the preparation of methylgranatonine from the pomegranate root, an oily substance may be separated from which the author has isolated a *base* of the composition $C_9H_{17}ON$. On decomposing the picrate by means of potassium carbonate, it is obtained as a colourless oil which has a very faint basic odour and boils at 114–117° under 26 mm. pressure. It is soluble in water in all proportions, giving a strongly alkaline solution. The *picrate*, $C_{15}H_{20}O_8N_4$, forms a crystalline powder melting at 152–153° and soluble in boiling alcohol. The *aurichloride*, $C_9H_{17}ONHAuCl_4$, separates from dilute hydrochloric acid in orange-yellow rosettes and melts at 115–117°. The *hydrochloride* is a viscous mass soluble in water.

Pomegranate Bark. E. Ewers. (*Archiv der Pharm.*, ccxxxviii. 8; *Chemist and Druggist*, lvi. 595.) The author recently examined a number of commercial samples of pomegranate bark, and stated that the root and stem barks contained practically the same amount of alkaloid, the quantity being fairly constant between 0·5 and 0·7 per cent. (see *Year-Book of Pharmacy*, 1899, 137). He now points out that the samples referred to were of South European origin, and that the higher results published are probably due to the use of Java bark, and that low results are due to the employment of old bark. A sample of the Java root has now been obtained, and four estimations yielded 0·97, 0·92, 0·98, and 0·95 per cent.

Deterioration of Wild Cherry Bark with Age. A. B. Stevens. (*Amer. Journ. Pharm.*, 1899, 497.) The author has estimated the amount of hydrocyanic acid in barks examined at different times, as March, 1898, and March, 1899. He found a more marked deterioration in the powdered bark than in the whole bark when kept in the usual containers. He recommended that the whole fresh bark only be used in the manufacture of galenical preparations, and says that the bark is best preserved in glass or air-tight containers.

Wild Cherry Bark and its Preparations. A. B. Stevens. (*Amer. Journ. Pharm.*, 1900, 300.) Experiments were made by the author with the object of ascertaining which portion of the bark contained the glucoside, and it was found that the inner

layer contained practically all of this principle, not much being found in the middle layer and none in the outer layer. The fact was also revealed that, there being more of the green layer of bark on the north side of the tree, more of the glucoside was found in this portion than in that on the south side. Experiments with the fluid extract showed the U.S. pharmacopœial method to be unsatisfactory, as the amount of menstruum is too small and also owing to the fact that evaporation does not leave a trace of acid. With regard to the syrup the author thinks that maceration should be carried on in the percolator in which the drug is to be exhausted, and that the percolate should be allowed to run direct on to the sugar.

Cinnamon in the Treatment of Tropical Diarrhœa. A. N. Wilkinson. (*Brit. Med. Journ.*, February 10th, 1900, 317, 318.) The author speaks highly of the action of cinnamon in tropical diarrhœa, and has been very successful with it in cases in which the usual remedies failed. He administers it in teaspoonful doses of the powdered drug, mixed with a little milk to mould it in the shape of a bolus which is then chewed. Such a dose is given night and morning. A mixture of quinine sulphate, potassium bromide, and antifebrin was also given three times a day, combined with starch enemata containing opium and chloral.

Alcornoco Bark. C. Hartwich. (*Oest. Zeit. für Pharm.*, liii. 115.) This South American drug is the produce of *Bowdichia virgilioides* belonging to the *Cæsalpiniæ*. It is recommended by the author as a substitute for jaborandi leaves, the physiological action of which it is stated to possess in a still higher degree.

New False Cinchonas. C. Hartwich. (*Amer. Journ. Pharm.*, August, 1899, from *Arch. der Pharm.*) The author describes four barks placed on the market as cinchona:—The first, designated as South American "pseudo-china," was found to be identical with "china bicolorata," first noticed by Brown in 1793. The author traced its source to the genus *Antirrhœa*, N.O. *Rubiaceæ*, and it is apparently from the species *Aristata*. This diagnosis is based on the presence of "stabzellen," and of silica crystals in the cells of the medullary rays, as well as the thickened cell walls of the phelloderm. The bark contains an alkaloid—not, however, quinine or cinchonine. Moreover, it does not respond to Grahe's test. The second, called "china cuprea," while closely resembling cuprea bark, is not the product of a *Remijia*, but seemed a species of *Buena*. It contained no alkaloids, had the red-brown colour

of cuprea barks, but differed microscopically by the form of the milk vessels in the primary bark, by the two sizes of sclerotic cells in the secondary bark and by the spindle-shaped cells at the base.

The third, which came from St. Domingo, was astringent and contained no alkaloid. Its microscopical structure indicated that it did not even belong to the N.O. *Rubiaceæ*, as shown by the presence of large quadratic crystals of calcium oxalate. The peculiar medullary rays, occasionally but one cell wide and then at times greatly broadened, suggested its relationship to the genus *Bucida*, N.O. *Combretaceæ*.

The fourth was stated to be of Columbian origin. It contained neither tannin nor alkaloids, and was in the form of quills, of a yellowish-grey-brown externally and dark brown on the inner surface. Its origin could not be traced by microscopical means.

Mixed with it was another bark resembling it closely, but astringent. The axillary lengthened secretion receptacles, the calcium oxalate glands in the medullary rays and the primary bast bundles—all pointed to its origin from the genus *Croton*, possibly *C. Malambo*.

Assay of Cinchona Bark. E. R. Squibb. (*Amer. Journ. Pharm.*, 1899, 312–320.) The author effects the exhaustion of the powdered bark by means of acetic acid of 10 per cent. strength in an apparatus which is a modification on a small scale of his syphon percolator. A woodcut illustration of the extractor will be found in the original paper. The complete extraction of 10 grammes of the powder is effected in 36 hours, the entire percolate measuring 180 to 200 c.c. This percolate is evaporated until the residue, though still liquid whilst hot, is semi-solid on cooling. The weight of this residue usually amounts to about 35 to 38 per cent. of the bark used. The extract is dissolved in a mixture of ammonia and alcohol, more ammonia is added to ensure the liberation of the whole of the alkaloids, and the separation effected by shaking out with chloroform. The alkaloids are then taken up with decinormal sulphuric acid, precipitated with decinormal potassium hydrate, and again taken up with ether. Finally, the varnish-like residue left on evaporating the ethereal solution is weighed in order to get the approximate percentage of alkaloids, after which the alkaloids are converted into acid salts and titrated. The author divides the alkaloids of cinchona into three groups: (1) The quinine group, with a molecular weight of about 0·324; (2) the cinchonine group, with a

molecular weight of about 0·294; (3) the remaining alkaloids, with a molecular weight of about 0·312. For pharmaceutical purposes, he thinks no cinchona bark should contain less than 5 per cent. of total alkaloids, of which at least half should belong to the quinine group, and one-fourth each to the other two groups. That proportion being arbitrarily assumed, a combining weight of 0·314 is obtained and adopted as the factor for total alkaloids in the assay process.

Cortex Lokri. W. P. H. van Driessen Mareeuw. (*Ned. Tijd. Pharm.*, xi. 227–234. From *Chem. Centr.*, 1899, 589.) The drug reported upon under the name of *Cortex Lokri* is obtained from *Hymenea Courbaril*. It contains 2·7 per cent. of catechin, 23·6 of catechu-tannic acid, and 0·6 of fat, and yields 7·6 per cent. of ash.

Euonymus Atropurpureus. M. Hoehnel. (*Pharm. Zeitung*, 1900, 268.) The bark of this plant has been repeatedly stated to contain mannite. The author finds, however, that the saccharine constituent of this bark is not mannite, but dulcite.

Muira-Puama. MM. Cæsar and Loretz. (*Pharm. Centralh.*, xl. 611. From *Pharm. Journ.*) This drug stands in high repute in Brazil as an aphrodisiac. The authors recommend the following pharmaceutical preparations for use:—*Fluid Extract of Muira-puama.*—100 parts of muira-puama wood in coarse powder are macerated with 20 parts of alcohol of 90 per cent. and 10 parts of glycerin for two hours, and then percolated with dilute spirit to complete exhaustion; about 400–500 parts of dilute alcohol are required. The dose is 2 to 3 grammes two or three times a day. *Wine of Muira-puama.*—This is prepared by macerating 100 parts of the wood with 25 parts of 90 per cent. alcohol, 25 parts of distilled water, and 950 parts of sherry wine for 10 days, then pressing and filtering. The dose is from 20 to 30 grammes two or three times a day.

A new Constituent of Helleborus Fetidus. P. Vadam. (*Journ. de Pharm. et de Chim.* [3], ix. 515.) The leaves of this plant are shown to contain a powerful oxidising ferment possessing the general characters of the oxydases and exhibiting the same reactions. It loses its activity at or near 100° C. It is precipitated from its aqueous solutions by alcohol.

Anti-Emetic Properties of Bixa Orellana. J. S. Gurie. (*Pharm. Zeit.*, xliv. 108.) The leaves of the annatto plant, *Bixa orellana*, are used in Paramaribo as an anti-emetic. They are usually administered in the form of a decoction. The author has

isolated from them a bitter glucoside which is only slightly soluble in water, but readily soluble in alcohol or chloroform.

Constituents of Hedera Helix. M. Houdas. (*Comptes Rendus*, 1899, 1463–1465.) The author has isolated from ivy a glucoside, *hederin*, $C_{64}H_{104}O_{19}$, which crystallises from alcohol in radiating groups of long thin needles having a slightly sweetish taste, and melting at 248°. It is insoluble in water, petroleum ether, or chloroform, slightly soluble in ether and benzol, and more freely soluble in alcohol. It can be dissolved in hot water by the aid of alkalies. On hydrolysis with sulphuric acid it yields *hederidin*, $C_{26}H_{40}O_4$, *hederose*, $C_6H_{12}O_6$, and rhamnose.

Physiological Action of Ivy (Hedera Helix) and Hederin. A. Joanin. (*Comptes Rendus*, 1899, 1476–1478.) On cold-blooded animals, hederin has not a very strong toxic action, 5 milligrammes being required to kill a frog of from 35 to 40 grammes weight; a slow and progressive paralysis sets in, death occurring after 24 or 30 hours. With warm-blooded animals, the action is more intense, the doses necessary to produce death being 5 to 7, 3 to 4, or 2 to 3 centigrammes per kilogramme of body weight, according as the injection is hypodermic, intraperitoneal, or intravenous. In all three cases, the symptoms are prostration, shivering, hypothermy often very accentuated, flatulence, diarrhœa sometimes sanguineous, coma, and death. When injected into a dog's stomach, hederin causes abundant vomitings and has also a very pronounced purgative action. Hederin causes a lowering of the arterial pressure which is transitory for small doses, but with large doses the decrease of pressure increases until death occurs. Hederin is hence an emeto-cathartic, and to its presence ivy owes its emetic and purgative effects; the nervous symptoms caused by ivy are probably due to some other principle.

Digitalis and its Active Principles. J. W. England. (*Amer. Journ. Pharm.*, 1899, 379.) The author points out that digitoxin, though probably the most definite chemical principle contained in digitalis, does not represent the entire physiological activity of the drug. K. Hofmann has shown that the effects of digitoxin are not manifested in less than six hours, while digitalis and some of its other principles produced marked effects within half an hour or an hour; and this great difference, together with other considerations, is thought to preclude the acceptance of Kiliani's claim that digitoxin is the most important therapeutic principle of the leaves.

Mulberry Leaves as a Diuretic. (From *Bull. gén. de Thérap.*) Mulberry leaves enjoy a reputation in Siberia as a diuretic, and are

given in the form of a tea made by infusing the leaves for about 8 hours. A cupful of this tea is taken night and morning.

Hamamelis Virginica. G. E. Cooley. (*Journ. Pharmacol.*, vii. 52.) The leaves of *Hamamelis virginica* collected in the autumn are found to contain more tannin than those collected in the spring. The cell walls of the hairs are comparatively thin in the spring, and thicken gradually towards autumn, when a dark line often marks the lumen of the cell. At the same time the colourless walls become coloured yellow and the granular and oily contents disappear. The autumn leaves are official in the U.S.P.

Psathura Angustifolia. E. Heckel and F. Schlagdenhauffen. (*Répertoire de Pharm.*, xii. 54–60.) The leaves of various species of *Psathura*, belonging to the *Rubiaceæ*, are used in the island of Réunion, in the form of an infusion similar to tea, as an aromatic digestive stimulant and diaphoretic. According to Kobert, the leaves of *Psathura angustifolia* contain an alkaloid closely resembling if not identical with caffeine. The authors have recently examined the leaves of this plant, and of other species of *Psathura*, and find neither caffeine nor any other active principle of the xanthine group present. A search for glucosides also gave negative results. The leaves contain about 19 per cent. of tannin, and 6·5 per cent. of gum, besides fat, wax, chlorophyll, a red colouring matter, and about 4 per cent. of mineral constituents, among which traces of lithium chloride were detected.

Palta Leaves. E. Merck. (*Merck's Bericht*, 1899; *Pharm. Zeitung*, 1900, 190.) The author states that the leaves of *Maytenus vitis idæa*, a plant belonging to the natural order *Celastraceæ* is much esteemed in Argentina, where it is indigenous, for the treatment of certain forms of deafness, cataract, and inflammation of the gums. The drug is known locally by the following names:—*Palta*, *Colquiyuyu*, *Capia gangona*, *Chaplan*, and *Sombra de toro carapé*.

Symplocarpus Fœtidus. MM. Cæsar and Loretz. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 814.) The leaves of this plant are stated to possess antispasmodic properties, and to prove very useful for the relief of attacks of asthma.

Pilocarpus Racemosus. M. Rocher. (*Répertoire* [3], xi. 439.) The leaves of this species, a native of the French Antilles, are stated to contain 1 per cent. of total alkaloids, of which 0·6 per cent. is pilocarpine. The author has also isolated an aromatic essential oil, the properties and composition of which are being investigated.

Jaborandi Leaves. J. C. Umney. (*Pharm. Journ.*, 4th series, x. 8.) The author states that at the present time the leaves of *Pilocarpus jaborandi*, Holmes, are not obtainable in commerce, the principal supplies consisting of the leaves of *P. selloanus* or *P. microphyllus*.

Small Jaborandi Leaves as an Adulterant of Coca Leaves. J. Barclay. (*Chemist and Druggist*, lv. 1030.) A sample parcel of coca leaves recently obtained from a London broker was found to consist of from 40 to 50 per cent. of small jaborandi leaves mixed with Bolivian coca. The bulk of the adulterant leaves had the following characters:—From $\frac{5}{8}$ inch to $1\frac{1}{2}$ inch in length, from $\frac{3}{8}$ inch to 1 inch broad, margin entire, revolute, unequal at the base, without petiole, oval-oblong in shape. A smaller proportion of lanceolate leaves with short petioles, but in other respects similar, was also present, but the characters of the two varieties corresponded generally with those described by Holmes as belonging to *Pilocarpus microphyllus* and *P. spicatus* respectively. Both varieties may readily be distinguished from coca leaves, the apex of which is quite different, and which possess the well-known curved line from base to apex at each side of the midrib. The leaves were extracted and pilocarpine obtained from them, which was identified by the green coloration produced with sulphuric acid and potassium bichromate.

Spurious Alexandrian Senna. H. G. Greenish. (*Pharm. Journ.*, 4th series, ix. 470, 471.) According to the statements usually met with in text books of materia medica, Alexandrian senna is liable to adulteration with a variety of foreign leaves, comprising those of *Solenostemma Argel*, *Tephrosia Apollinea*, *Coriaria myrtifolia*, *Colutea arborescens*, and *Globularia alypum*. In order to prevent erroneous conceptions the author points out, however, that the occurrence of any of these leaves in Alexandrian senna, or their substitution for that drug, is at the present time extremely rare, and that most of them possess nowadays little more than historic interest. The principal admixture he has observed has been an occasional leaflet of *Cassia obovata*.

Recently a considerable quantity of a drug imported from Suez has been offered on the London market as Alexandrian senna. It resembles Alexandrian senna in colour and general appearance, but is easily distinguished by the shape of the leaflets of which it is composed. These are sharply characterised by their obovate outline, rounded mucronate apex, and distinct pinnate venation. The upper surface is glabrous, but the lower distinctly pubescent.

They attain 2 cm. in length by 1 cm. in breadth, but are usually a little smaller. They have the odour of senna, and a similar but rather more mucilaginous taste. The samples the author has seen contained a few stalks, but no flowers, fruits, or foreign leaves. In shape and general characters the leaflets agree well with those of *Cassia obovata*. Thirty years ago, or more, these leaflets formed a regular constituent of Alexandrian senna, which at that time was a mixture of the leaflets of *Cassia obovata* and *C. acutifolia*, and leaves of *Solenostemma Argel*. The author has endeavoured to ascertain whether their presence could be detected in powdered senna. He furnishes the following structural description :—

The transverse section of either of the official sennas shows a midrib, supported above and below by a crescent-shaped bundle of sclerenchymatous fibres. These fibres are accompanied by longitudinal rows of parenchymatous cells, each containing a prism of calcium oxalate. Beneath the epidermis of either surface there is a single row of elongated palisade cells, the spongy parenchyma being much reduced. Both palisade and spongy parenchyma contain an occasional cluster crystal of calcium oxalate, whilst some of the epidermal cells contain mucilage, and others are developed into warty hairs.

The leaflets of the drug in question present similar features. Palisade occurs on both surfaces; the spongy parenchyma is much reduced. Mucilage is deposited in some of the epidermal cells, whilst one-celled, thick-walled hairs, sometimes nearly straight, but often curved, are frequent on the under-surface. But the difference in most of the epidermal cells of the under-surface is very striking, for they form distinct projecting papillæ. When the surface of the lower epidermis is examined these papillæ appear as more or less distinct, but seldom sharply defined, rings. There is, therefore, little difficulty in distinguishing this drug from the official sennas, even when reduced to a fine powder, for fragments of the lower epidermis may always be found; and should the drug find its way into commerce, either in the form of powdered senna or compound liquorice powder, it could be easily identified.

The author has examined several specimens of *Cassia obovata*, and finds the leaflets regularly exhibit this character, although the prominence of the papillæ is not always equally well marked.

As the leaves of *Colutea arborescens* bear a certain resemblance to *Cassia obovata*, the author has also examined these, and finds that they too can be easily distinguished from *C. obovata*, as well as from both the official sennas. Although the cells of the

lower epidermis show a slight papillose swelling, this is much less marked than it is in *C. obovata*. The stomata on the under surface are usually surrounded by three, four, or five cells, whereas in the sennas there are usually two only, and the hairs attain a much greater length; moreover the sclerenchymatous fibres of the midrib are wanting, and with them the rows of calcium oxalate crystals.

Wood-cut illustrations of the structural characters of *Cassia obovata* and *Colutea arborescens* will be found in the original paper.

Adulterants of China Tea. E. Collin. (*Pharm. Chim.*, xi. [1], 15–21; and [2], 52–59. From *Journ. Soc. Chem. Ind.*) The leaves of many plants of diverse geographical origin have been used as adulterants of tea. Those which resemble the Chinese leaf in shape, odour, and astringency, and possess dentate margins, such as *Fraxinus excelsior*, *Sambucus nigra*, *Spiræa salicifolia*, and *Trigonella cærulea* were formerly employed. When these leaves, cut in small pieces, are treated with a solution of caffeine, they so far resemble the genuine article that sophistication has often been undetected. Since, however, the histology of Chinese tea has been better known and microscopic examination more frequently employed, leaves which possess similar anatomical elements, such as those of *Camellia japonica*, *Phyllirea angustifolia*, and *Olea europæa* have been more generally made use of. The Chinese have also adapted themselves to meet the advance of expert knowledge; a spurious tea was exported some years since in considerable quantity under the name of "Canton made Tea" or "Imperial Tea," which Riche found to contain no caffeine, and the author showed to be composed of a leaf, other than that of *Camellia thea*, the botanical source of which is undetermined. Under the name of "Kaporie tea," the leaves of *Epilobium angustifolium* are largely employed in Russia as a substitute for tea, a considerable trade being done in the product. The leaves of *Epilobium hirsutum* are also employed for the same purpose. In the same country, a fictitious tea is also made from the leaves of *Vaccinium arctostaphylos*, and occasionally from those of *V. myrtillus*, which, under the name of "Caucasus tea" or "Thé du Dutais," has a considerable consumption. Wood-cut illustrations of microscopical sections of the leaves, and a minute account of the distinctive histological elements of Chinese tea, and of the two last-named substitutes accompany the paper.

Assay of the of Leaves Datura Stramonium, Hyoscyamus Niger, and Atropa Belladonna. E. Schmidt. (*Apoth. Zeit.*, xv.

13–14.) 10 grammes of the dried and powdered leaves are shaken with 90 grammes of ether and 30 grammes of chloroform, 10 c.c. of a 10 per cent. solution of sodium hydrate added, and the whole frequently shaken for 3 hours; 10 c.c. of water are then added, and after an hour 60 grammes of the clear chloroform-ether solution (=5 grammes of the leaves) are filtered. This is distilled to about one-half, and the residue shaken in a separating funnel with 10 c.c. of centinormal hydrochloric acid. This is collected, and the chloroform is washed thrice with 10 c.c. of water. The acid solution is filtered, the washings being also passed through the same filter, which is finally washed until the total filtrate measures 100 c.c. The liquid is covered with 1 cm. layer of ether, 5 drops of alcoholic solution of iodoeosin (1 : 500) are added, and the excess of acid is titrated with centinormal potassium hydrate until the aqueous layer turns pale rose-red. A blank experiment is then made in the same manner, and the amount of alkaloid is calculated from the hydrochloric acid used for its neutralisation.

Assay of Hyoscyamus. W. A. Puckner. (*Amer. Journ. Pharm.*, 1899, 499.) The modified method of A. W. Gerrard, followed by F. X. Moerk in his work on belladonna leaves (*Amer. Journ. Pharm.*, 1899, 105), has been applied by the author to henbane. The directions of Moerk were closely adhered to with one exception: in the final extraction of the alkaloid pure chloroform was substituted for the ether-chloroform mixture, thus avoiding the formation of an emulsion, and with it the addition of stearic acid. The alkaloidal residue from 20 grammes of drug required 0·65 c.c. of decinormal acid. In a duplicate determination, 0·60 c.c. was used. The average, 0·63 c.c., indicated 0·91 per cent. of alkaloid, and corresponded to the yield obtained with Schwickerath's altered method.

Lotus Arabicus: The Nature and Origin of its Poison. W. R. Dunstan and T. A. Henry. (*Chemical News*, lxxxi. 301.) *Lotus Arabicus* is a small leguminous plant resembling a vetch, indigenous to Egypt and Northern Africa. It grows abundantly in Nubia, and is especially noticeable in the bed of the Nile from Luxor to Wady Halfa. It is known to the natives as "Khuther," and old plants with ripe seed are used as fodder. At certain stages of its growth it is highly poisonous to horses, sheep, and goats, the poisonous property being most marked in the young plant up to the period of seeding.

It was found that when moistened with water and crushed, the

leaves of the plant evolved prussic acid in considerable quantity, the amount being greatest in the plant just before and least just after the flowering period. Further investigation has shown that the prussic acid originates with a yellow crystalline glucoside ($C_{22}H_{19}NO_{10}$), which it is proposed to name *lotusin*. Under the influence of an enzyme, also contained in the plant, lotusin is rapidly hydrolysed, forming hydrocyanic acid, dextrose, and a new yellow colouring matter (*lotoflavin*). The hydrolysis may be effected by dilute acids, but it is only very slowly brought about by emulsin, and not at all by diastase. The peculiar enzyme, which it is proposed to call *lotase*, appears to be distinct from the enzymes already known. Its activity is rapidly abolished by contact with alcohol, and it has only a feeble action on amygdalin. Old plants are found to contain lotase but no lotusin.

The decomposition which ensues on bringing lotase into contact with lotusin, as is the case when the plant is crushed in the presence of moisture, may be represented by the following equation :—

$$\underset{\text{Lotusin}}{C_{22}H_{19}NO_{10}} + 2H_2O = \underset{\text{Lotoflavin}}{C_{15}H_{10}O_6} + \underset{\text{Hydrocyanic acid}}{HCN} + \underset{\text{Dextrose}}{C_6H_{12}O_6}$$

Kalagua as a Substitute for Kola. MM. Hendrickx and Coremans. (*Journ. de Pharm. d'Anvers*, 1900, 174.) The authors report very favourably on the value of the leaves of *Theobroma kalagua* as a stimulant, especially with regard to its power of assisting the processes of nutrition. They regard it as a very suitable substitute for kola. The plant, which belongs to the *Sterculiaceæ*, is a native of Central America, being found from 10 degrees north to 10 degrees south of the equator. Their experiments were conducted with the dried leaves. In addition to the properties already referred to, the drug is found to have a distinct diuretic action and to possess marked microbicidal powers, without, however, possessing any antipyretic or antiseptic properties. Its use in the treatment of tuberculosis has been repeatedly advocated.

The Pharmacology of Cannabis Indica. W. E. Dixon. (*Brit. Med. Journ.*, 1899, 1354–1357.) The author arrives at the conclusion that Indian hemp exerts its effects differently according to the preparation used, the fresh plant, for instance, being diuretic, while in the dried state it exhibits little of this action. Its effects vary according to the manner in which it is taken into the system; when smoked, exhilaration is most manifest, whilst when taken

by the mouth in small quantities exhilaration is generally not observed. It is recommended that, where an immediate effect is desired, the drug should be smoked, the fumes being drawn through water. In fits of depression, mental fatigue, nervous headache, and exhaustion, a few inhalations are said to produce an almost immediate effect, causing sense of depression, headache, and feeling of fatigue to disappear, and the subject being enabled to continue his work, feeling refreshed and soothed. Other results claimed are to give staying power and alter the feelings of muscular fatigue which follow hard physical labour. Absorption does not occur for one to two hours when the drug is taken by the mouth, but the effects produced are more lasting than when it is inhaled. Hemp taken as an inhalation is placed in the same category as coffee, tea and kola, being free from danger and without alarming effects. In fact, the author has come to regard it, in this form, as a useful and refreshing stimulant and food accessory, and one whose use does not lead to a habit which grows upon its votary. If taken by the mouth hemp must be classified with the narcotics, and when given in that way the nervous effects produced may be such as to cause serious alarm, though no danger is to be apprehended whilst the heart remains regular and strong. In the author's opinion, cannabis indica can never become popular until its active principle has been isolated in the form of a compound of fixed strength. Like any other stimulant or sedative narcotic, hemp may be abused, as when taken to produce an intoxicant or deliriant effect, but this abuse is rare, and there is reason to believe has been grossly exaggerated. Finally, from a frequent observation of hemp, both subjective and objective, the author affirms that hemp is soothing and stimulating, being a specially valuable cerebral stimulant when inhaled. He believes it to be an exceedingly useful therapeutic agent, one not likely to lead to abuse, and producing in proper dosage no untoward after-effects.

Parnassia Palustris in Epilepsy. W. Peters. (*Pharm. Centralh.*, xl. 611.) This plant is stated to have proved efficacious in the treatment of epilepsy. The author employs the entire herb, either in the form of a 1 : 5 tincture in ½ drachm doses, or in the form of a tea made by infusing 2 teaspoonfuls of the herb in 500 c.c. of boiling water for 15 minutes. Half of this tea is taken at night and the other half in the morning.

Australian Indigenous Vegetable Drugs. J. H. Maiden. (*Pharm. Journ.*, 4th series, ix. 16–18, 27–28, 51–52, 68–70, 164–166, 181–182.) This paper contains notices of drugs obtained from the following

plants:—*Eugenia jambolana*, species of *Leptospermum*, *Melaleuca leucadendron*, *M. uncinata*, *Melastoma malabathricum*, *Ammannia indica*, *Epilobium tetragonum*, *Bryonia laciniosa*, *Cucumis trigonus*, *Lagenaria vulgaris*, *Luffa ægyptiaca*, *Mesembryanthemum æquilaterale*, *Hydrocotyle asiatica*, *Trachymene incisa*, *Loranthus quandang*, *Morinda citrifolia*, *Sarcocephalus cordatus*, *Cymbonotus lawsonianus*, *Elephantopus scaber*, *Gnaphalium luteo-album*, *Myriogyne minuta*, *Pterocaulon glandulosus*, species of *Senecio* and of *Vernonia*, *Marlea vitiensis*, species of *Goodenia*, *Lobelia purpurascens*, species of *Astroloma*, *Plumbago zeylanica*, *Egiceras majus*, *Achras laurifolia*, *A. sapota*, *Chionanthus pierophloia*, *Alstonia constricta*, *A. scholaris*, *Alyxia buxifolia*, *Carissa ovata*, *Cerbera odollam*, *Ochrosia moorei*, *Tabernæmontana orientalis*, *T. sphærocarpa*, *Sarcostemma australe*, *Tylophora asthmatica*, *Strychnos psilosperma*, *Erythræa australis*, *Sebæa ovata*, *Cordia myxa*, *Heliotropium ovalifolium*, *Trichodesma zeylanicum*, *Evolvulus alsinoides*, *Ipomæa Pes-capræ*, *Anthocercis littorea*, *A. viscosa*, *Duboisia*, *myoporoides*, *Solanum aviculare*, *S. verbascifolium*, *Gratiola pedunculata*, *Herpestis monniera*, *Scoparia dulcis*, *Justicia procumbens*, *Eremophila maculata*, *Callicarpa longifolia*, *Clerodendron inerme*, *Verbena officinalis*, *Mentha gracilis*, *M. saturcioides*, *Moschosma polystachya*, *Ocimum sanctum*, *Plectranthus congestus*, *Prostanthera rotundifolia*, *Codonocarpus cotinifolius*, *Muehlenbeckia adpressa*, *Achyranthes aspera*, *Alternanthera triandra*, *Atherosperma moschata*, *Piptocalyx moorei*, *Daphnandra micrantha*, *D. repandula*, *Doryphora sassafras*, *Cassytha filiformis*, species of *Cinnamomum*, *Cryptocarya australis*, species of *Litsæa*, *Grevillea mimosoides*, *Isopogon ceratophyllus*, *Wikstræmia indica*, species of *Cleistanthus*, *Croton phebalioides*, species of *Euphorbia*, *Excæcaria agallocha*, *E. parvifolia*, *Mallotus phillipensis*, *Petalostigma quadriloculare*, species of *Phyllanthus*, *Ficus glomerata*, *Laportea gigas*, *Casuarina equisetifolia*, *Piper Novæ-Hollandiæ*, *Exocarpus cupressiformis*, *Macrozamia spiralis*, *Dendrobium teretifolium*, species of *Crinum*, *Tacca pinnatifida*, species of *Dioscorea*, *Asparagus racemosus*, *Flagellaria indica*, *Smilax glycyphylla*, *Xyris indica*, *Cocos nucifera*, *Colocasia antiquorum*, *C. macrorrhiza*, *Typha angustifolia*, *Andropogon citreus*, *Psilotum triquetrum*, *Adiantum æthiopicum*, and *Pteris aquilina*.

For particulars, reference should be made to the original paper.

Bocconia Cordata. P. Murrill and J. O. Schlotterbeck. (*Amer. Journ. Pharm.*, 1900, 297.) The plant is a native of Japan, and belongs to the *Papaveraceæ*. It has been introduced into the United States, and is commonly known as tree celandine. All the parts of the plant examined by the authors contained alkaloids, these being present in largest amount in the rhizome. Three distinct alkaloids were isolated and subjected to combustion analysis. These were *protopine*, $C_{20}H_{19}NO_5$, *β-homochelidonine*, $C_{21}H_{21}NO_5$, and *chelerythrine*, $C_{21}H_{17}NO_4+C_2H_5OH$. Sanguinarine has been reported as present in the plant, but the authors have not been able to identify the free alkaloid.

Some West African Drugs. J. S. Ward. (*Pharm. Journ.*, 4th series, x. 279-280.) This paper comprises notices of the following drugs:—*Akotompoteng*, a root probably derived from a species of *Xylopia*; *Toantin*, a root the source of which has not been identified; *Ekum-Nkura*, a bark of uncertain origin, probably from a *Bauhinia*, N.O. *Leguminosæ*; *Nkokobesah* or *Inconchery*, a root not identified; *Adeseckanchie*, the root and bark of *Sarcocephalus esculentus*, N.O. *Cinchonaceæ*; *Yarney Crop*, from a species of *Gladiolus*, probably *G. spicatus*; *Atsunobie Bark*, not identified; *Peyarebiasah*, also an unidentified bark; and *Bongbo*, consisting of pods of *Cassia sieberiana*. For particulars, reference should be made to the source above named.

Curanga Amara. S. E. Boorsma. (*Chem. Centr.*, 1899, 991, 992, 1125, and 1900, 298.) This drug owes its febrifuge properties to *curangin*, a bitter non-toxic glucoside of the composition $C_{18}H_{77}O_{20}$, which may be extracted from it by means of ethyl acetate. This glucoside is easily soluble in ethyl or methyl alcohol, or in acetone of ethyl acetate containing water; 100 parts of water dissolve 0·18 part. The solutions are neutral. When heated at 100°, curangin loses 7–10 per cent. of water, but the residue regains this amount on exposure to air. Its colour reactions, etc., are described in detail.

Some Mexican Drugs. M. Duyk. (*Bull. de Pharm. de Brux.*, xliii. 269 and 306. From *Pharm. Journ.*) According to the author, the leaves, fruits, and gum resin of *Schinus molle* are used in Mexico as drugs. The two former yield, on distillation, a colourless volatile oil, having the sp. gr. 0·852, which may be of use in the treatment of gonorrhœa. The gum resin is white and odourless, with a bitter, acrid taste. It melts at 40° C., and forms a persistent emulsion with water. The resin, freed from the accompanying gum, is yellow, at first semi-fluid, but soon becoming

hard. It is soluble in alkalies. Toussaint has found that the gum resin, in emulsion in water, is toxic, in doses of 2 grammes, giving rise to gastro-enteritis, vomiting, frequent bloodstained evacuations, followed by a marked lowering of the temperature, and ultimately by death. In therapeutic doses, Orvagnanos finds that it acts as a powerful purgative, and modifies the respiration. He gives it in the form of pills containing 10 centigrammes. *Capulincillo.*—This drug, derived from *Rhamnus humboldtianus*, which grows plentifully in many provinces of Mexico, is a violent poison, analogous to curare, producing paralysis. It has been employed, but with little success, in the treatment of hydrophobia and tetanus. The fruits of the tree contain a non-toxic, non-drying, fixed oil, free from taste and odour. A considerable commerce is done with this in Mexico. *Cozticpatli.*—This drug, the root of *Thalictrum hernandezii*, known to the Aztecs as Llamaron Cozticpatli, or yellow root, is employed as a diuretic. It contains, besides the yellow colouring matter, a peculiar alkaloid crystallising in prisms, and a greenish resin with an unpleasant odour. *Cuajiote.*—The gum resin from several Burseraceous trees is included under this name; the drug is employed by the natives as a remedy for scorpion bites. It occurs in the form of white or yellowish, odourless, bitter, and acrid tears or irregular sticks. Given internally, it is a purgative, approaching gamboge in its action. *Chilpauxochitl.*— This is the odourless, acrid, woody, branched root of *Lobelia laxiflora* var. *angustifolia*; according to Morales, it contains the volatile alkaloid lobeline. The fresh juice causes reddening when applied to the skin. "Simonillo," a composite (*Conga filaginoides* and *C. parvifolia*), was known to ancient Mexicans by the name "Zaca-chichic" and "Zacate-chichic" as a cholagogue and antidyspeptic. It gives a very bitter decoction, which froths when shaken. The bitter taste is due to a glucoside, lennesin, isolated by Altamirano. The drug is said to be useful in the treatment of catarrh, and is prescribed as an infusion 1 : 40. "Tlolocopetale" is a poisonous plant belonging to the genus *Coriaria*; it contains coriarin and coriamyrtin, and may be used to replace digitalis or caffeine. "Yerba del Tabardillo," from *Piqueria trinervia*, which is used as a sudorific and febrifuge by the Indians, contains an alkaloid, piquerine, which crystallises in white prismatic needles, has no odour, and faint bitter taste. "Yerba del Pollo," *Commelina pallida.* The action of this drug is analogous to that of hamamelis. It is used as a hæmostatic and for leucorrhœa. The most active preparations are the fresh juice

of the leaves for external application, and the decoction and extract for internal use. Exposure to high temperature during the preparation of the extract reduces the activity of the drug. The dose for internal use is 5 to 20 grammes of the dried plant, or 10 to 20 centigrammes of the extract, in pills.

Ceanothus Americanus. H. M. Gordin. (*Amer. Journ. Pharm.*, 1900, 298.) The author has obtained from this plant about $\frac{1}{5}$ per cent. of an alkaloidal principle, the nature and properties of which are still under investigation.

Proximate Analysis of Eupatorium Perfoliatum. C. A. Walter. (*Amer. Journ. Pharm.*, 1900, 301.) The chief constituents isolated and studied by the author were: (1) a colouring principle, $C_{27}H_{30}O_{17}$; (2) a tannin, $C_{12}H_{18}O_7$; and (3) a bitter principle, $C_{35}H_{58}NO_{10}$.

Plumiera Lancifolia. N. Franchimont. (*Chem. Zeit. Repert.*, xxiii. 334.) The author finds that the bitter principles isolated from this plant by S. E. Boorsma and by E. Merck, respectively, are identical, and that the difference previously observed in the melting points was due merely to a difference in the amount of water of crystallisation. A description of the properties of the principle (plumieride) is given in the paper.

Three New Species of Eucalyptus. R. T. Baker. (*Proc. Linn. Soc. of N.S.W.*, 1899, 292–300. From *Journ. Soc. Chem. Ind.*) *E. Smithii.*—The kino gives a turbid solution in cold water and contains eudesmin but not aromadendrin. The yield of essential oil is high, 1·354 per cent., it consists almost entirely of eucalyptol and dextropinene, phellandrene is absent. The oil has a low specific gravity, but contains 70 per cent. of eucalyptol.

E. Dawsonii.—"Slaty Gum." The kino is similar to that of *E. Smithii.* The yield of oil is only 0·172 per cent., its specific gravity is 0·9414 at 15° C., its chief constituent is a sesquiterpene; phellandrene is also present. It contains no eucalyptol.

E. Camphora.—"Sallow" or "Swamp Gum." The yield of oi is 0·398 per cent.; it contains eudesmol, pinene, and eucalyptol. No phellandrene was detected. The sp. gr. is 0·9167 at 15° C.

The Physiological Effects of Anhalonium Lewinii. W. E. Dixon. (*Journ. Physiol.*, September, 1899, 69 and 71. From *Pharm. Journ.*) The author finds that "Mescal" acts differently from any other known substance, although in isolated properties it resembles many. *Cannabis indica*, which it was at first thought to resemble most closely, differs from it in producing delusions of merriment and a hypnotic effect; "Mescal" never gives rise to

merriment, but rather to a condition of ideal content, and produces wakefulness. It is closely related to strychnine by its marked effect on the brain and cord, but whereas strychnine acts mainly on the cord, the effect of "Mescal" is mainly cerebral, and opisthotonos never occurs. It resembles nicotine in its effects on nerve, first paralysing nerve cells and then fibres. Other properties of "Mescal" may be compared to those of digitalis and cocaine, but in each case with marked contrasts. In its peculiar stimulation of the occipital cerebrum "Mescal" appears to stand alone. Its properties lead the author to hope that it may be of use in therapeutics: the fact that even after very small doses a feeling of well-being and exhilaration results, points to its use as a general stimulant to the central nervous system, the diminution in the kinæsthetic sensations possibly making it of special use in melancholia. Further, it is possible that its effect on slowing the heart by a direct action on cardiac muscle and in small doses increasing the force of the beat may be found of use.

With regard to the anhalonium alkaloids, the author states that the isomeric bases, anhalonine and anhalonidine, $C_{12}H_{15}NO_3$, are identical in their physiological effects. Lophophorine ($C_{13}H_{17}NO_3$) belongs to the same series, differing only by the addition of CH_2: this addition, however, appears to have the effect of increasing the toxicity. Mezcaline ($C_{11}H_{17}NO_3$), though apparently differing somewhat in constitution, is also closely allied to the other bases, and its physiological action is almost indistinguishable from that of anhalonine.

The Active Constituents of the Wallflower (Cheiranthus Cheiri). M. Reeb. (*Chem. Zeit. Repert.*, xxiii. 293, from *Arch. exp. Path. Pharm.*, xliii. 130–148.) *Cheiranthin*, the glucosidal constituent of the wallflower, has been previously reported upon by the author, and shown to resemble the digitalis principles in its action on the heart (see *Year-Book of Pharmacy*, 1899, 145). He now finds that the alcoholic extract of the seeds produces also a specific action on the nervous system, which is due to the presence of an alkaloid of the composition $C_{18}H_{35}O_{17}N_3$, for which he proposes the name *cheirinine*. This base crystallises in small, colourless needles, melts at 73–74°, and is soluble in warm water, alcohol, ether, chloroform, or ethyl acetate. The aqueous solution is neutral and gives precipitates with the ordinary alkaloidal reagents. The physiological action of cheirinine resembles that of quinine.

Assay of Santonica. J. Katz. (*Archiv der Pharm.*, ccxxxvii. 245, 246.) 10 grammes of the coarsely powdered flower heads are

extracted with ether for 2 hours in a Soxhlet apparatus. The ether is distilled off, and the residue is boiled for $\frac{1}{4}$–$\frac{1}{2}$ hour in a reflux apparatus with a solution of 5·0 grammes of crystallised barium hydrate in 100 c.c. of water. The solution is allowed to cool, and is then saturated with carbonic anhydride, until it reddens blue litmus paper; it is then filtered at once, and washed twice, each time with about 20 c.c. of water. The filtrate is concentrated on the water-bath to a volume of about 20 c.c., mixed with 10 c.c. of dilute (12·5 per cent.) hydrochloric acid, warmed for 2 minutes more (no longer), allowed to cool, and poured into a separating funnel, any crystals of santonin that remain in the basin being rinsed into the funnel with about 20 c.c. of chloroform. The mixture in the funnel is then shaken well, and the chloroform solution is drawn off and filtered, dish, funnel, and filter being washed twice with about 20 c.c. of chloroform. The chloroform is then distilled off, and the residue boiled for 10 minutes in a reflux apparatus with 50 c.c. of 15 per cent. alcohol; the hot solution is filtered into a weighed flask, the apparatus employed being rinsed twice into the flask with 10 c.c. of boiling 15 per cent. alcohol, after which the flask is covered with a watch-glass and set aside for 24 hours. The flask is then weighed; the contents are filtered through a weighed filter of 9 cm. diameter (any milkiness in the filtrate, due to resinous matter, being neglected), and flask and filter are washed with 10 c.c. of 15 per cent. alcohol; the filter is dried in the flask, and the latter is weighed. For every 10 grammes of the alcoholic filtrate, excluding the last 10 c.c., 0·006 gramme must be added to the weight of santonin found, to correct for the solubility of the latter in the alcohol. In two test experiments 0·2640 and 0·2834 gramme of santonin were obtained instead of 0·2770 and 0·2862 taken.

A modification of the above process may be introduced, owing to the fact that santonin only reacts with alcoholic potash at 80–90°, whereas the accompanying resin does so at the ordinary temperature. The solution in 15 per cent. alcohol is evaporated, the residue is dissolved in 20–30 c.c. of absolute alcohol, 3 drops of phenolphthalein are added, and then $N/10$ potash solution until the pink colour is permanent for 10 minutes. At this point, 20 c.c. of $N/10$ potash are added at once, the solution is heated to boiling, diluted with 50 c.c. of cold water, and titrated with $N/10$ hydrochloric acid. A blank experiment is performed to ascertain the effect of the glass on the potash. From the 20 c.c. are subtracted the volume of acid used, and of potash neutralised in the

blank experiment, and the remainder is multiplied by 0·0246, which gives the weight of santonin present. In an experiment made to test the possibility of titrating santonin in alcoholic solution, 0·3100 gramme were found instead of 0·3080 taken. In another experiment, 3·21 and 3·38 per cent. were found, as against 3·16 by the gravimetric method.

In 10 samples of the drug the percentage of santonin was found to range from 1·21 to 3·16; in the tincture prepared from these by percolation with five times their weight of 90 per cent. alcohol, it ranged from 0·212 to 0·628.

Kola Nuts. K. Schumann. (*Pharm. Zeitung*, 1900, 124.) The author throws light on the cause of the variation in colour and form exhibited by the kola nuts of commerce. It is well known that there are two principal kinds of kola nuts met with, differing considerably in their size. The large one is the better one, and contains more caffeine than the small variety. The latter, which has four cotyledons, is the produce of *Cola acuminata*, while the large kind, which has only two cotyledons, is now shown by the author to be derived from a new species which he has named *Cola vera*. The fruit of *C. acuminata* has a fleshy yellow pericarp having a characteristic odour and containing 4 or 5 large seeds. When the seed germinates, the four cotyledons spread open and the plumule grows up in the centre, while in the seed of *C. vera*, the two cotyledons remain closed, and the plumule rises on the outside. With regard to the leaves of the two plants, the author states that the veins are more prominent in the leaves of *C. vera* than in those of *C. acuminata*, but are usually less numerous. The dried leaves of *C. vera* are tan-coloured, and much more shining on the under surface than those of *C. acuminata*, which are much darker in colour and by comparison appear almost brown or black. The androecium of *C. vera* is perfectly sessile, and has only 14 to 16 anthers, whereas that of *C. acuminata* is not quite sessile, and shows never less than 20 anthers.

The author also directs attention to *Cola lepidota* and *C. anomala*, the nuts of which are used by the natives in the same manner as true kola nuts. Mention is also made of the Bal tree, *C. cordifolia*, the large leaves of which are used for wrapping kola nuts to keep them fresh.

Woodcut illustrations of *Cola acuminata* and of *C. vera* will be found in the original paper, and also in a summary of the author's report by E. M. Holmes in *Pharm. Journ.*, 4th series, x. 665.

Detection of Shikimi Fruit in Star Anise. W. Lenz. (*Amer. Journ. Pharm.*, 1900, 75, 76, from *Schweiz. Wochenschr. für Chem. und Pharm.*, 1899, 45.) Working with authentic samples of star anise and shikimi the author has critically examined some of the published methods for distinguishing these closely similar fruits. The processes tried were :—(1) Tschirch and Oesterle's, which is based on the differing behaviour of alcoholic extracts of the two fruits when poured into water—a method criticised by von Vogl ; (2) difference in size and appearance of the aleuron grains found in the seed ; (3) Collin's method, based on the presence of numerous and large sclerenchyma cells in the stipe of star anise and the comparative absence of the same in the stipe of shikimi.

The author finds the last two methods to be practically useless, while Tschirch's is satisfactory. The latter, modified as follows, is perfectly trustworthy :—

One carpel of the suspected fruit is boiled in a test tube for two minutes with 5 c.c. of 95 per cent. alcohol. The cold liquid (which has lost about 1 c.c. by evaporation) is filtered and the filtrate treated with four or five times its bulk of water. If the fruit is star anise, the liquid invariably becomes cloudy (due to anethol), while a shikimi extract remains clear.

When the clear diluted shikimi extract is shaken with petroleum ether (boiling under 60° C.) and separated, the ethereal layer leaves scarcely any residue on evaporation, and that trace has a disagreeable odour.

The cloudy star anise extract, on the other hand, when similarly treated, yields an ethereal layer which, on evaporation, leaves a yellow oily residue of anise odour. Efforts to obtain from this residue microscopic crystals of di-brom-anethol, or di-iso-nitroso-anethol-peroxide, were futile, but the presence of anethol was readily proved by the spectroscope.

Chaulmoogra Seed. E. M. Holmes. (*Pharm. Journ.*, 4th series, x. 522.) As there seems to be some confusion concerning the seeds sold as chaulmoogra, the author draws attention to the three varieties that pass under that name, and supplies the following information :—

"(1) *Gynocardia odorata*, R.Br.—Genuine chaulmoogra seeds are irregular in size and shape, *quite smooth* externally, of a greyish colour, or with a pale brownish tinge, 1 to $1\frac{1}{4}$ inch long and $\frac{5}{8}$ to $\frac{3}{4}$ inch broad in the widest diameter (*Cooke's Report*, 1876, p. 16, Fig. 8). The kernel shows two flat thin cordate ovate cotyledons and a straight radicle, immersed in oily albumin.

"(2) *Hydnocarpus anthelmintica*, Pierre.—These are the seeds figured by Daniel Hanbury (*Pharm. Journ.* [2], iii. p. 23, and *Science Papers*, p. 244). F. Porter Smith, in the *Materia Medica of China* (1871) described them (p. 140) under the name of "Lucrabau (chaulmoogra) seeds," imported into China from Siam, and gave the Chinese name as "Ta-fung-tsze." He evidently considered them to be identical with chaulmoogra seeds, although he remarked that "the Indian nuts are somewhat different from the Siamese samples, the testa being thin, smooth and fragile in the former case." Hanbury showed that the Siamese and Indian seeds could not be identical. Subsequently, Dr. Pierre, formerly at Saigon, obtained specimens of the plant and described it as a new species, under the name of *Hydnocarpus anthelmintica*, Pierre (*Pharm. Journ.* [3], xv., p. 41). A specimen from Lu mountain, in the province of Bien Hoa, in Southern Cochin China, was presented by him to the Herbarium of the Society in 1884. The illustration given in *Science Papers* does not accurately represent the marking on the seed coat. The seeds, when freed from adherent dried pulp, with which many of them are coated, are about $\frac{1}{2}$ to $\frac{3}{4}$ inch long and $\frac{3}{8}$ to $\frac{1}{2}$ inch broad in the widest diameter; *marked at one end with short radiating interrupted ridges*, occupying about one-third of the length of the seed. The rest of the surface is slightly rough to the touch with very faint raised points and lines running in a longitudinal direction. The embryo resembles in character that of *Gynocardia odorata*, but the radicle sometimes faces the side of the seed and sometimes the base. A dark stain-like chalaza is visible on the outer surface at the end of the seed opposite the radicle. The ridges on the testa are at the chalazal end.

"(3) *Hydnocarpus wightiana*, Blume.—These seeds are rather more uniformly obovate and *taper more to one end* than the previous two, and *are strongly marked with irregular raised rough and minutely warty* lines. The rough surface readily distinguishes them at sight, and the colour is more of an ashen than a brownish grey. The embryo also shows three distinct veins on each cotyledon as in the other species. The testa is thin and more easily crushed than in the other two species. The fruit is figured in *Cooke's Report*, p. 17. The seeds are only half the price of the genuine seeds of *Gynocardia odorata*. The tree is a native of Western India, and the oil is employed on the Malabar Coast in cutaneous diseases and ophthalmia, and for ulcers on the feet. It has been taken internally for leprosy, syphilis, and rheumatism, but, like

chaulmoogra oil, acts occasionally as a gastro-intestinal irritant (Watt, *Dict. Econ. Prod. India*, vol. iv. p. 309)."

The foregoing descriptions are illustrated by woodcuts, for which the *Pharmaceutical Journal* should be referred to.

The author also refers to a kind of chaulmoogra seed recently referred to by G. Desprez, and stated to come from Sikkim (*Journ. de Pharm.* [6], xi. 315, and *Pharm. Journ.*, 4th series, x. 495). From the description there given he is inclined to believe that it may be the seed of *Hydnocarpus wightiana* above described.

Mastuerzo Fruit. M. Stuckert. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 204, from *Merck's Bericht*, 1900.) The author calls attention to the fruit of *Prosopis strombulifera*, a member of the *Leguminosæ*, which is indigenous to Argentina, where it is highly esteemed in the form of an aqueous infusion for the external and internal treatment of diarrhœa and gonorrhœa. It is also claimed to act as an abortifacient. The fruit is decidedly astringent in character. It is known locally by the following names:—Mastuerzo, retortuna, mastorcido, pata de gallo. The author states that the plant belongs to a separate division of the genus *Prosopis*, viz., *Strombocarpa*, and was given the name *Spirolobium australe* by D'Orbigny.

Sophisticated Vanilla. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 579.) Good Bourbon vanilla shows a thick coating of crystals of vanillin which form in the course of time on the exterior of the pods. The same appearance is sometimes given to inferior sorts of vanilla by exposing the pods to the vapour of benzoic acid, so as to allow the latter to condense on the pods. Such crystals have an acid reaction, and may be easily identified, after separation from the pods, by dissolving them in ether, shaking the clear ethereal solution with an aqueous solution of sodium bisulphite (to remove any vanillin), allowing the ethereal layer to evaporate and testing the residue by dissolving it in ammonia, evaporating the solution to dryness, taking up the residue with water, and adding to the aqueous solution a few drops of very weak solution of ferric chloride. A brownish-red precipitate thus obtained proves the presence of benzoic acid.

Assay of Vanilla Pods. W. Busse. (*Zeitschr. für Unters. der Nahr und Genussm.*, vi. 519; *Pharm. Journ.*, 4th series, ix. 377.) A known weight of the pods, crushed with sand, is extracted in a Soxhlet tube with ether, the ethereal extract is shaken out with sodium bisulphite solution; from the latter, the vanillin is liberated by treatment with H_2SO_4, the SO_2 generated removed by a

current of $C O_2$, and the vanillin extracted by shaking out with ether, evaporating the solvent, and weighing the residue. In East African vanilla the author found 2·16 per cent. of vanillin, in that from Ceylon 1·48 per cent., and in Tahiti vanilla from 1·55 to 2·02 per cent. Tiemann and Haarman found in the best Bourbon vanilla 1·94 to 2·90 per cent., and in the best Java vanilla 2·75 per cent. The author does not consider that the vanillin content of a sample of vanilla bears any marked relation to its value as a flavouring agent, the aroma of the pods not being due solely to the vanillin they contain.

Poisonous Action of Vanilla. M. Audeoud. (*Rev. Méd. de la Suisse Rom.*, Oct. 20, 1899; *Brit. Med. Journ.*, Jan. 6, 1900; *Epit.*, No. 4.) The author has observed an outbreak of poisoning among women employed in a factory where the crude vanilla fruit was prepared for commerce. The symptons were local and general. The local symptoms consisted of a papulo-vesicular eruption on the arms and face, which the author attributes to the presence of an irritant volatile oil "cardol" in the pods. The mildew which covers the pods may cause coryza and erythema, and the crystals of vanillin may give rise to a burning sensation. The nervous symptoms he considers due chiefly to the inhalation of the scent, which has all the properties of the aromatic aldehydes. Poisoning by vanilla, when used as a flavouring in food, has been described, though it is uncertain whether in these cases the vanilla or the food were the cause of the symptoms.

Datura Fastuosa. W. P. H. van Driessen Mareeuw. (*Chem. Centr.*, 1899, 539.) The author has examined the seeds of this plant, which he finds to contain 0·149 of hyoscyamine and 10·9 per cent. of a fatty oil.

Linseed in its Botanical, Chemical, and Agricultural Relations. A. Herzog. (*Journ. Chem. Soc.*, from *Bied. Centr.*, 1899, 544–545.) Linseed contains, on the average, water, 7·5; crude protein, 23; crude fat, 35; nitrogen-free extract, 22·2; crude fibre, 8·8; and ash, 3·5 per cent. The pure ash contains K_2O, 28·41; MgO, 13; and P_2O_5, 44 per cent.

During the growth of the plant, oil migrates from the leaves to the seeds, where it is first transformed into starch. Subsequently (chiefly between the periods of flowering and ripening) the starch is transformed again into oil. According to Schischkin, the amount of oil in the seeds is influenced by manuring.

Anagyris Fœtida. M. Klostermann. (*Chem. Centr.*, 1899, 1130.) By evaporating the alcoholic extract of the seeds of

Anagyris fœtida, precipitating the aqueous solution with lead acetate, and decomposing the precipitate with hydrogen sulphide, a mixture of cytisine and anagyrine is obtained, from which the latter may be separated by dissolving in water acidified with hydrochloric acid and precipitating as the mercurichloride, whilst the former is isolated by making the solution alkaline and extracting with chloroform. A full description of the two alkaloids and of a number of their compounds and derivatives will be found in the original paper.

Kosam Seeds. (*Bull. Comm.*, xxviii. 131; *Pharm. Journ.*, 4th series, x. 687.) Heckel and Schlagdenhauffen describe the seeds of *Brucea sumatrana*, a Simaroubaceous plant, indigenous to the hot regions of China and India, as being contained in a greyish egg-shaped drupe. Recently Phisalix and Bertrand have isolated a glucoside, *kosamin*, the first-named authors having previously recorded the presence of fixed oil, gum, quassin, saponin, and sugar in the fruits. Kosamin, according to Dybowski, is the main active principle of the drug. Moungal has given the seeds with success in cases of metrorrhagia, diarrhœa and dysentery. The decorticated crushed seed is employed, the paste obtained being made into pills. Five seeds are given to children for the first day, six seeds for the three succeeding days. For adults the dose is ten seeds for the initial day, and twelve for succeeding days. The value of the drug as a remedy for dysentery seems to have been known to the Abyssinians long ago. According to Mongeout, the stem and root barks are preferable to the seeds for internal administration, owing to the large amount of fat present in the seeds, which delays digestion and hinders the action of the drug.

Fenugreek. G. D'Ancona. (*Landw. Versuchs.-Stat.*, li. 387–396; *Journ. Chem. Soc.*, 1900, ii. 364.) Analysis of two samples of fenugreek gave the following results:—Nitrogenous matter, 13·74 and 13·02; fat, 3·31 and 3·54; crude fibre, 31·75 and 29·36; nitrogen-free extract, 45·79 and 48·14; ash, 5·42 and 5·94 per cent. in the dry matter. In general composition fenugreek resembles *Trifolium incarnatum*.

Therapeutic Properties of Bilberries. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 247.) Strauss recommends an extract of bilberries in intestinal colic, and administers this preparation in the form of suppositories prepared according to the following formula: —Extr. vaccinii myrtilli, 30·0; potassæ carb., 3·0; aq. destill., 7·0; ol. cacao, 60 grammes. M. f. suppos. 30. Two of these are applied daily.

A New Constituent of Delphinium Staphisagria. F. B. Ahrens. (*Ber. der deutsch. chem. Ges.*, xxxii. 1581–1584, and 1669–1670.) After the extraction of the alkaloids, delphinine, delphinoidene, delphisine, and staphisagrine from the seeds of *Delphinium staphisagria* by means of chloroform, a small quantity of a substance insoluble in this solvent remains behind. This alkaloid, to which the author gives the name *staphisagroine*, $C_{40}H_{16}N_2O_7$, is a faintly yellow, amorphous powder which melts at 275–277°, and is practically insoluble in all the usual solvents; it dissolves in dilute hydrochloric acid, from which solution it is re-precipitated on adding ammonia. It does not give any of the colour reactions characteristic of the delphinium alkaloids. The picrate, aurichloride, and platinochloride are described. An attempt to regenerate the alkaloid by decomposing the platinochloride with sulphuretted hydrogen gave rise to another base, *staphisagroidine*, $C_{40}H_{40}N_2O_4$, a brownish powder melting at 185°.

The Active Principle of Capsicum. C. Micko. (*Pharm. Centralh.*, xl. 672.) The author confirms his previous statement that "capsaicin," $C_{18}H_{28}NO_3$, is the pungent and active principle of the fruit of *Capsicum annuum* (see *Year-Book of Pharmacy*, 1899, 63). He finds it to be likewise the active principle of *Capsicum fastigiatum*. In its pure state this substance is odourless, but otherwise it seems to be identical with the "capsacutin" described by Norbitz.

Occurrence of Copper in Nux Vomica. J. R. Hill. (*Pharm. Journ.*, 4th series, x. 417.) Having detected copper in a sample of tincture of nux vomica, the author examined a sample of fluid extract, guaranteed never to have been in contact with copper during the process of manufacture. This, too, was found to give evidence of this metal; and, subsequently, traces of copper were also detected by him in commercial specimens of powdered nux vomica and likewise in the uncrushed seeds.

Assay of Ergot. F. Musset. (*Pharm. Centralh.*, xl. 396.) The ethereal solution obtained according to Keller's directions contains, besides the cornutine, a resinous matter causing the results to be too high. By treating the weighed residue repeatedly with water containing 0·5 per cent. of hydrogen chloride, the cornutine dissolves and the insoluble resin may be weighed and allowed for.

Preservation of Ergot. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 229, from *Journ. de Pharm. et de Chim.*) Pees recommends that a small tube be placed in the container in which the ergot is held, and

this filled with potassium sulphate, upon which formaldehyde solution is sprinkled. The formaldehyde should be renewed from time to time. Veniez has preserved ergot unchanged for years over unslaked lime.

The Toxicity of the Fly Agaric (Agaricus Muscarius). S. Pouchet. (*Bull. gén. de Thérap.*, cxxxvii. 901; *Pharm. Journ.*, 4th series, ix. 139.) The author finds that this fungus contains albuminoids, which, though not highly toxic themselves, greatly increase the toxicity of the alkaloid muscarine contained in the juice. This is attributed to the action of the albuminoids on the intestinal mucous membrane. The lethal dose of the juice deprived of these albuminoids is much larger than that in the normal state. The observed symptoms differ: the simultaneous injections of what alone would be non-toxic doses, both of the alkaloid and of the albuminoids, is speedily followed by death. Experiments are being conducted to determine if the observed toxicity of other organic substances, such as curare, may not be at least partly due to the action of some such albuminoids, which alone are of comparatively low toxicity, but which aid the absorption of the toxic alkaloids.

Fungus Poisons which Decompose Blood. R. Kobert. (*Journ. Chem. Soc.*, from *Sitzungsber. naturf. Ges. Rostock*, 1899, No. 5.) *Agaricus phalloides* contains at least two poisons, consisting of an alkaloid and a toxalbumin. When the alkaloid, which is soluble in alcohol but insoluble in ether, is administered to rabbits or cats, neither decomposition of the blood nor fatty degeneration of the organs takes place. The toxalbumin *phallin* has a stronger action than helvellic acid, but resembles it in dissolving the red corpuscles of the blood, dissolved oxyhæmoglobin, glycerophosphoric acid, and fragments of stroma also taking part in the action. By the liberation of glycerophosphoric acid, the alkalinity of the blood is decreased, the soluble hæmoglobin partially converted into methæmoglobin, and cyanose formed. A solution of phallin in 100,000 parts of water is sufficient to show the dissolving action on the red blood-corpuscles. Sections obtained from animals which had been poisoned by phallin showed many exudations of blood into the various organs. In many cases, the blood and urine were found to contain methæmoglobin or bile-colouring matters, and in most cases the kidneys were greatly affected. Phallin could not be detected in mushrooms or other edible fungi.

Nectria Ditissima. Observations on Animal and Vegetable Cancer. M. Bra. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 325,

from *Comptes Rendus*, cxxix. 118.) The author records some interesting observations on the analogies presented by cultures of *Nectria ditissima*, the fungus which produces "cancer" in trees, and those of the parasitic fungus which accompanies cancer in man and other animals. In the former case the cultures produced round spores about 1 μ in diameter, having a strong tendency to agglomerate and multiplying endogenously by budding. The spores, spherules, conids, and hyphæ present staining reactions and biological characters identical with those of the human parasite. Inoculations of trees with cultures of the human parasite resulted in a "cancer" in all respects resembling that produced by *Nectria*; and conversely, the ingestion of rabbits by cultures of *Nectria* caused the production, in about three months, of round ulcers in the stomach similar to those produced by the ingestion of cultures of the human parasite.

The Bacillus of Leprosy. M. Carrasquilla. (*Brit. Med. Journ.*, Oct. 14th, 1899; *Epit.*, No. 310.) The author reports that he has succeeded in cultivating the lepra bacillus in human blood serum. Two forms were observed: (1) long and slender bacilli, (2) short and almost elliptical in shape. The author concludes that the bacillus obtained by him is Hansen's bacillus, because: (1) it resists decoloration by 30 per cent. nitric acid; (2) there was no reason to believe that any other organism was introduced when the tubes were inoculated; (3) the filtered fluid from the cultures when injected into horses produces the same reaction as serum from lepers' blood; (4) the serum of horses subjected to injections of culture filtrates produces the same reactions in lepers as the serum from horses infected with serum of lepers' blood; (5) the bacillus stains in the same way as Hansen's bacillus. The author hopes to succeed in inoculating animals with the cultured bacillus, and so prove his point.

Arrow Poison of Wakamba. L. Brieger. (*Deutsch. med. Wochenschr.*, xxv. No. 39.) This arrow poison from German East Africa resembles digitalis in its physiological action. Its active principle is a powerfully toxic glucoside of the composition $C_{29}H_{46}O_{19}$, which crystallises from a hot saturated solution in anhydrous needles melting at 182–184° C. When allowed to crystallise very slowly it is obtained in plates containing 20 per cent. of water, and in this condition it melts at 93–94° C. It is insoluble in ether, ethyl acetate, chloroform, or benzol, slightly soluble in cold water, and more easily soluble in hot water or alcohol. The aqueous solution is lævogyre. On long-continued boiling with

mineral acids, a yellow amorphous precipitate is formed, which is readily soluble in alcohol, and is free from toxicity. The aqueous solution, after the removal of this precipitate by filtration, reduces Fehling's solution, which is not affected by the glucoside itself. The glucoside dissolves in concentrated sulphuric acid with a reddish-brown colour and green fluorescence. With tannic acid and the usual alkaloidal reagents the substance gives no precipitate. A dose of 0·3 milligramme per kilogramme of body weight proved fatal in the case of dogs in 2 hours.

Cochineal. G. F. Merson. (*Chemist and Druggist*, lvi. 517, 518.) The B.P. requires the ash of this drug not to exceed 6 per cent. The author has examined thirty-one commercial samples of dark-grain and silver cochineal, and found the ash percentage to vary from 2·4 to 43·6 per cent. The dark-grain samples, however, yielded 3·7 to 12·4, while the silver variety yielded from 2·4 upwards. No fewer than twelve out of twenty-five samples yielded 11·2 per cent. and over. For the purpose of approximately estimating the colouring matter, the author notes the number of c.c. of chlorinated soda solution (containing 1 per cent. of available chlorine) required to decolorise 1 gramme of the cochineal. The amounts varied from about 22·4 c.c. in the case of the best to 9·6 c.c. for the poorest samples. The following is the *modus operandi* suggested :—

Weigh 0·5 gramme of finely-powdered cochineal; place in a 100 c.c. flask with 30 c.c. of distilled water, and 5 drops of liquor ammoniæ; heat to boiling-point, strain through cotton-wool into a 100 c.c. flask, and wash with sufficient water to produce 100 c.c. The marc on the wool should now be quite colourless. Put 25 c.c. of the liquid into a 100 c.c. stoppered test-mixer, add 5 c.c. of strong hydrochloric acid, and sufficient distilled water to produce 100 c.c. Run in 0·5 c.c. at a time of solution of chlorinated lime (or soda), containing 1 per cent. of available chlorine, till the cherry-red colour changes to dull orange, shaking briskly after each addition. Continue adding chlorinated solution in 0·1 c.c. portions as long as the colour is being bleached. When almost completed, note the burette-reading, and after adding a further 0·1 c.c. of solution, shake the liquid slightly and see if the top layer is lighter than the lower. If there is no difference, the reaction is finished; if the lower stratum is darker, continue to add chlorinated solution drop by drop till the reaction is quite complete.

The author arrives at the conclusion that cochineal is largely adulterated, but that there is little difficulty in obtaining genuine

cochineal yielding about 2½ per cent. of ash. He suggests that the ash limit given in the Pharmacopœia is too high, and should be fixed at not more than 4 per cent. He also thinks that some process of colour valuation on the lines indicated above should be added to the present official tests.

Assay of Cantharides. Gehe and Co. (*Pharm. Centralh.*, xl. 230.) Twenty-five grammes of cantharides are macerated for 24 hours with 100 c.c. of chloroform and 2 c.c. of H Cl, with occasional agitation. The mixture is then filtered on a covered filter, 62 c.c. of the filtrate are taken, and the solvent is evaporated. The residue is treated with 5 c.c. of petroleum ether, and thrown upon a small tared filter, washed with two successive portions, each of 10 c.c., of petroleum ether, and dried at 60° C. From cantharides of good quality, the weight of cantharidin thus obtained should be not less than 0·12 gramme, equivalent to about 0·8 per cent.

Saccharine Secretion of Euonymus Japonica. L. Maquenne. (*Bull. Soc. Chim.*, xxi. 1082–1083.) The honey-like substance which is sometimes found in dry seasons at the extremities of the branches of *Euonymus japonica* is an exudation of the cell contents due to the punctures of insects; it is at first of a syrupy consistence, but soon dries to a crystalline mass. It has a marked sweet taste and is very soluble in water. When concentrated by evaporation, the solution deposits crystals of dulcite and leaves a brownish, syrupy residue in which dextrose and saccharic acid were detected.

Akakia. D. Hooper. (*Journ. Asiat. Soc. Bengal*, lxviii. 245. From *Pharm. Journ.*) The author states that this drug is an astringent extract of an *Acacia*, and is imported into India viâ Bombay from the Red Sea ports and the Persian Gulf. As sold by the native apothecary the drug is unsatisfactory owing to its variability. It has been used in the East for ages for a great variety of complaints.

A Substitute for Catechu. M. Picquet. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 8.) The author states that the extract of the bark of *Brugiera gymnorrhiza*, a variety of mangrove, which comes into the market under the name of Cay Day, is well suited to take the place of catechu. This variety of mangrove occurs in French Cochin China, and the French government is encouraging its further cultivation.

Butea Kino. D. Hooper. (*Pharm. Journ.*, 4th series, x. 664, 665.) This kino exudes from *Butea frondosa*, the Dhak, Palás,

or Bastard Teak Tree, which is very common in Central and Northern India. It is also obtained from *B. superba*, *B. minor*, and *B. parviflora*. It is sold in most Indian bazaars under the names of *Kamar kas*, *Dhak-ka-gond*, and *Kueni-ka-gond*. It is used as an astringent, and has also been employed for dyeing and tanning purposes. It is usually very impure owing to careless collection.

The following seven authentic samples of butea kino have been submitted to analysis during the past year. The moisture and ash were first determined in the usual manner. A portion of each specimen in a powdered condition was next extracted with alcohol of 90 per cent., to dissolve out the available tannin, and this principle was determined in the aqueous solution of the residue of the extract after evaporating off the spirit. The insoluble matter was calculated by difference.

	Water.	Tannin.	Non-Tannins Soluble.	Insoluble.	Ash.
1. Garhwal, N.W.P. . .	10·15	15·45	3·55	42·95	35·70
2. Saharanpur, N.W.P. .	14·35	23·10	10·90	46·10	5·55
3. Lucknow, N.W.P. . .	12·60	30·05	10·60	36·35	10·40
4. Ganjam, Madras . . .	14·05	35·30	8·50	36·40	5·75
5. Bengal	11·20	27·70	9·80	19·50	31·80
6. Rajputana	13·40	34·70	10·70	28·95	12·25
7. Panjab	13·30	62·20	7·65	9·90	6·95

With regard to the official recognition of butea kino in the *Indian and Colonial Appendix to the Pharmacopœia*, the author thinks that the kino from the present official source is of such a high standard and sufficiently abundant to meet all requirements for medical practice in India. Butea kino in its crude state is very impure, and it would be a matter of difficulty to adequately clean it for medicinal purposes. Moreover, butea kino, as a rule, is very inferior in its soluble properties, and its apparently rapid alteration from the soluble to the insoluble condition would render it objectionable for preparing tinctures.

The Tannin Value of Malabar Kino. D. Hooper. (*Pharm. Journ.*, 4th series, x. 226.) Malabar kino, in the state in which it exudes from the incised bark of *Pterocarpus marsupium*, is a thick red liquid of such a strength that 100 c.c. affords 50 grammes of dry kino. During the process of evaporation the drug breaks up into the peculiar angular fragments by which it

is known in commerce. The hide powder process was used in the determination of the following nine samples of kino. They were all collected by Forest officers, and although not all from Malabar, they were obtained from the official botanical source.

	Water.	Tannin.	Non-Tannins.	Insoluble.	Ash.	Tannin in Dry Substance.
1	15·3	79·1	4·1	—	1·5	93·2
2	14·6	82·4	1·6	0·4	1·0	96·5
3	14·9	78·4	4·6	1·0	1·1	92·1
4	15·7	79·0	3·8	—	1·5	93·7
5	14·7	79·5	4·2	—	1·6	93·2
6	15·7	79·6	1·1	1·3	2·3	94·4
7	13·5	76·4	4·0	4·0	2·1	88·3
8	15·1	70·0	11·5	1·5	1·9	82·4
9	12·2	70·4	10·6	5·1	1·7	80·2

The astringent character of Malabar kino is very marked according to these results. Eliminating the last three, which were derived from the Central Provinces, and collected as an experiment, the yield of tannic acid in the dry substance is over 90 per cent.

The only quantitative test for kino in the present British Pharmacopœia, that not less than 80 per cent. should be soluble in boiling water, is quite consistent with the above results. The 80 per cent. of extractive matter, together with 15 per cent. of water natural to the kino, would leave a margin of 5 per cent. for insoluble impurities.

The above tests were made on fresh specimens of dried juice, and it is probable that this accounts for the superiority of the products just reported upon. The gelatinisation of tincture of kino is supposed to be due to a molecular alteration of the tannic acid, whereby it becomes insoluble in diluted alcohol.

An insoluble tannin is similarly liable to form in the kino on prolonged storage or exposure in a dry state.

Bulgarian Opium. S. Hartwich. (*Schweiz. Wochenschr.*, 1899, 121.) The author has examined nine samples of Bulgarian opium, and found the percentage of morphine in the desiccated drug to range from 6·6 to 20·75 per cent.

Volumetric Assay of Opium. H. M. Gordin and A. B. Prescott. (*Archiv der Pharm.*, ccxxxvii. 380–384; also *Amer. Journ. Pharm.*, 1899, 522–524.) The method previously described by the authors (see *Year-Book of Pharmacy*, 1899, 161)

is now modified in so far that the maceration of the drug with the ammoniacal mixture is continued for 5–6 instead of 3 hours and the evaporation of the liquid is effected at the ordinary temperature in a current of air. Further, the morphine is extracted by percolation with a mixture of chloroform and absolute alcohol (5:1 by volume) instead of with acetone, and the evaporation of the solvent is again effected in a good draught; an excellent percolator for this purpose is obtained by cutting off the upper 3/5 of a 50 c.c. burette, and using the lower part with a plug of cotton-wool placed above the stopcock.

An alkalimetric estimation may also be employed, either alone or combined with the iodometric one. In this case, 3 grammes of the drug are treated just as in the other method up to the evaporation of the chloroform-alcohol mixture. The residue of morphine is then ground with 50 c.c. of $N/20$ sulphuric acid, and rinsed with water into a tall, narrow measuring cylinder, the whole diluted to 90 c.c., shaken, and allowed to settle for a time, after which 75 c.c. are filtered into a beaker and mixed with 30 or 35 c.c. of $N/20$ caustic potash, the excess of the latter being titrated finally with $N/20$ acid; the number of c.c. of acid neutralised by the morphine, multiplied by 0·568, gives the percentage of morphine in the opium. The indicator used is filter paper, dyed a pale yellow with neutral methyl-orange solution, and it is dipped for about 10 seconds in the liquid; the acid and alkali must be standardised under conditions similar to those of the estimation. If it is desired to control the result by an iodometric estimation, the titrated liquid is mixed with 3–4 grammes of calcium hydrate, diluted to 250 c.c., and shaken vigorously and frequently during an hour; 50 c.c. are then filtered into a 100 c.c. graduated flask, acidified, treated with excess of $N/10$ iodine solution, and titrated with thiosulphate, just as described in the previous paper; the weight of iodine used, multiplied by 150, gives the percentage of morphine.

In a sample of opium 17·66–17·90 per cent. of morphine were found by the alkalimetric and 17·49–17·50 by the iodometric method, but by the gravimetric method only 14 per cent. were found.

Nataloin and Homonataloin. E. Léger. (*Comptes Rendus*, cxxviii. 1401–1403.) Finely powdered Natal aloes was freed from resinous matters by cold digestion with acetone, and then extracted with boiling methyl alcohol and filtered; the filtrate, on cooling, deposited yellow, lamellar crystals which were separated

into two constituents by fractional crystallisation from the same solvent. The more soluble of these two is *nataloin*, $C_{16}H_{18}O_7$, while the name *homonataloin* is proposed for the less soluble constituent, the composition of which corresponds to the formula, $C_{15}H_{16}O_7$. Nataloin forms pale yellow scales less soluble in methyl alcohol than barbaloin, and insoluble in hot water or ether. Like barbaloin, it possesses a phenolic character, and dissolves in alkaline solutions, from which it is re-precipitated by carbonic anhydride. It dissolves in ammonia or pyridine, but combines with acids less readily than barbaloin. Homonataloin crystallises from methyl alcohol in nodular masses of yellow lamellæ.

Both these aloins can be distinguished from barbaloin by the following colour reactions:—A little manganese dioxide or potassium dichromate, added to a sulphuric acid solution of either of the two Natal aloins, develops a green coloration. A fragment of ammonium persulphate added to a sodium hydrate solution of the same aloins slowly develops a violet colour, which dyes silk, but cannot be fixed on mordanted cotton.

Sterculia Tomentosa and its Gum. E. Heckel. (*Amer. Journ. Pharm.*, 1900, 41.) *Sterculia tomentosa* is known in Central Africa under the names, *M'beppe*, *Kongosita*, *Komikosita*, *M'boborg*, and *Ici-ia-chixé*. It is a tree about 10 metres high, with a grey and scarred bark, villous cordate-orbiculate to trilobate leaves, reddish pentamerous flowers and small seeds containing oil and starch. The chief product is the gum exuding from the trunk, either spontaneously or favoured by incisions. The best yield is obtained from young and hardy plants. The gum resembles tragacanth, but contains no starch, and forms a viscid liquid, rather than a jelly, when treated with water. Its chief constituent is arabin.

The Gum of Grevillea Robusta. MM. Rœser and Puaux. (*Journ. de Pharm.* [6], x. 398–400.) The fresh gum is soft, and of a whitish colour, but on keeping it becomes hard, and of a yellowish, and often of a reddish, colour. It is odourless and possesses an astringent taste. It entirely dissolves in water, from which it is precipitated by 95 per cent. alcohol, and by basic lead acetate, after the addition of ammonia, until slightly alkaline. Its aqueous solution reduces Fehling's solution, and when warmed with ferric chloride, its colour deepens, but no precipitate is produced. When the gum is treated with mineral

acids, galactose and arabinose are produced. A complete analysis of the gum is given.

Gum Tragacanth. A. Hilger and W. E. Dreyfus. (*Journ. Chem. Soc.*, from *Ber. der deutsch. chem. Ges.*, xxxiii. 1178–1191.) Five different samples of gum tragacanth were found to contain 15·4–9·4 per cent. of water, and 3·1–2·7 of ash; also 15·1–22·4 of galactose (estimated as mucic acid), and 42–30 per cent. of arabinose (estimated as furfuraldehyde phenylhydrazone). The samples obtained by artificial incision of the plant contain the larger quantities of water and ash. A sample of vermicelli tragacanth contained 4 per cent. of cellulose and 3 of starch; allowing for these, the tragacanth proper is found to have the composition of a polysaccharide, $C_{11}H_{20}O_{10}$, for which the name bassorin should be reserved; this is quite insoluble in water. When the gum is boiled for 30 hours with 2 per cent. sulphuric acid, arabinose can be isolated from the product, but no other crystalline substance; the mother-liquors, however, yield mucic acid on oxidation. When it is allowed to remain 2–3 days in 35 per cent. potassium hydrate, and the alkaline solution precipitated with glacial acetic acid, *oxybassorin* $(C_{11}H_{20}O_{10})_2O$, is obtained. If the alkaline solution is neutralised with dilute acetic acid and precipitated with alcohol, a *potassium* derivative of oxybassorin is obtained; this is soluble in water and yields insoluble *copper* and *silver* derivatives by double decomposition. These compounds do not give the usual reactions of the metals, and cannot be regarded as true salts. The potassium derivative has the character of a simple sugar; it is strongly dextrorotatory, and reduces Fehling's solution and ammoniacal silver solution, but not Soldaini's reagent, and does not restore the colour to magenta solution decolorised with sulphurous acid. Sodium amalgam reduces an alkaline solution of oxybassorin to an optically inactive substance without reducing properties.

Commercial Myrrh. G. F. Merson. (*Pharm. Journ.*, 4th series, x. 42–44.) The author arrives at the following conclusions:—

(1) Myrrh is easily obtainable of good quality, and is not adulterated to any great extent, except by the inclusion of earthy matter which can readily be removed by sifting.

(2) The normal ash in good "sorts" does not exceed 5 per cent., which should be almost entirely soluble in dilute hydrochloric acid.

(3) One gramme when exhausted by 90 per cent. alcohol should

leave a residue which, when dried at 100° C., should not weigh more than 0·60 gramme.

Adulterated Scammony. F. Baucher. (*Journ. de Pharm.* [6], x. 172.) The author reports upon a specimen of scammony containing only 51 per cent. of resin soluble in ether, and largely adulterated with starch and galena. The presence of the latter cause the sample to appear studded with bluish-grey crystalline particles.

The Testing of Scammony. P. Guignes. (*Journ. de Pharm.* [3], xi. 529.) The author finds that the testing of scammony by estimating the amount of ether-soluble resin is liable to give rather variable results, according to the strength of the ether employed, the presence or absence of water or alcohol in this solvent, and the relative quantity of the ether employed for the extraction. From his results it appears that ether of 0·735 specific gravity, containing 15 per cent. of alcohol is a better solvent of the resin than absolute ether, while the presence of even a very small proportion of water seems to lessen the solubility of the resin considerably. It is also pointed out that a clear saturated solution of scammony resin in ether usually becomes turbid on the addition of a further quantity of the solvent.

Asafetida. C. G. Moore. (*Chemist and Druggist*, lv. 953.) The B.P. requires that asafetida shall yield not less than 65 per cent. of matter soluble in alcohol and shall not yield more than 10 per cent. of ash. The author has examined 12 samples of the commercial gum resin, and found that the percentage soluble in alcohol ranged from 14 to 39 and the ash from 26 to 63 per cent. As samples could be obtained yielding only 7 per cent. of ash, he is inclined to think that the sophistication of asafetida is intentional on the part of those who collect the drug. He also considers that the requirements of the B.P. are too high, unless steps can be taken to raise the standard of the commercial article.

Asafetida. J. C. Umney. (*Pharm. Journ.*, 4th series, x. 8.) Attention is directed by the author to the fact that there is little or no asafetida now in the market which meets the official requirements, the addition of earthy matters as adulterants in the country of collection prevailing to such an extent, that in no instance could average samples be obtained during the past eight years which came up to the B.P. standard. Some individual tears might be picked answering those requirements, but when a whole case of asafetida was examined, the ash was not usually less than 16 or 17

per cent., making due allowance for loss of weight (10 to 11 per cent.) in drying and powdering. The solubility of alcohol varied from 24 to 80 per cent. To meet the difficulty, so far as concerns the tincture, the author suggests that nearly double the proportion of asafetida ordered in the B.P. should be used for preparing it, and the tincture should be standardised so that 100 c.c. would yield 12 grammes of extractive. The only other alternative seemed to be the use of a purified, strained asafetida, which would involve a considerable loss of valuable volatile constituents of the drug.

Asafetida. E. M. Holmes. (*Chemist and Druggist*, lv. 1037.) The author points out that in none of the more recent Pharmacopœias of different countries is the ash of asafetida allowed to exceed 10 per cent. With regard to the scarcity of good qualities of this drug, he considers this purely a question of price, and thinks that if dealers will pay a good price, the demand will soon bring about a supply of higher qualities. He also emphasizes the fact that the standard of purity for drugs to be used in prescriptions should be the very highest obtainable, and regards it as inadvisable that the General Medical Council should countenance the use of a drug containing 20 to 60 per cent. of mineral matter to suit the convenience of buyers, who may wish to purchase a cheap article for technical and domestic purposes.

Opoponax. A. Tschirch and A. Knitt. (*Archiv der Pharm.*, ccxxxvii. 256–270.) The sample of opoponax examined by the authors was the product of the *Opoponax Chironium* (*Ferula Opoponax*). It was extracted with alcohol, when a gum remained undissolved. By extracting the alcoholic solution, which contained resin, with light petroleum, an essential oil was obtained. After evaporation of the alcohol, the resin which remained was dissolved in ether; a small portion, possessing the character of a tannol, remained undissolved. By shaking the ethereal solution with a concentrated solution of sodium bisulphite, vanillin was extracted. By shaking the ethereal solution next with 2–5 per cent. sodium carbonate solution until the former was no longer acid in reaction, ferulic acid was obtained. By boiling the resin with potassium carbonate solution 8 hours a day for 4 months, or by hydrolysing it with sulphuric acid instead, ferulic acid was obtained, but the loss in purification was very great. The alcohol produced simultaneously, *oporesinotannol*, was purified by dissolving it 40 times in alcohol and precipitating it with water acidified with hydrochloric acid, and then digesting

it with light petroleum. It is a pale brown powder having the character of a resinotannol, and the composition $C_{12}H_{13}O_2 \cdot OH$. It yields no umbelliferone on dry distillation. By dissolving the essential oil in ether, shaking the mixture with a solution of sodium bisulphite, and treating with ether, a waxy product was obtained, which, on sublimation, yielded needles melting at 133–134° C., and containing 66·6 per cent. of carbon and 2·7 per cent. of hydrogen. This substance is named *oponal*. The gummy constituent of the drug was optically inactive; it yielded 3·53 per cent. of ash containing 1·67 of calcium and 0·19 of magnesium. An arabic acid was prepared from it by dissolving it 40 times in water acidified with hydrochloric acid and precipitating it with alcohol; its composition is between $C_{12}H_{22}O_{11}$ and $C_6H_{10}O_5$. It yields mucic acid on oxidation with nitric acid.

100 parts of the drug were found to contain: resin soluble in ether (oporesinotannol ferulate), 51·8; resin insoluble in ether (free oporesinotannol), 1·90; gum, 33·8; essential oil, 8·3; free ferulic acid, 0·22; vanillin, 0·0027; moisture, 2·0; bassorin and plant remains, 2·0.

Composition of Olibanum. H. Halbey. (*Archiv der Pharm.*, ccxxxvi. 487.) Olibanum yields 4·7 per cent. of a volatile oil, containing pinene, dipentene, phellandrene and cadinene. The resinous portion of the drug consists mainly of *boswellinic acid*, $C_{32}H_{52}O_4$, and *olibanoresin* $(C_{14}H_2O)_n$ in equal proportions, with a little of the former acid in the state of ester. The gummy constituent is composed of arabin in combination with calcium and magnesium, and of bassorin. The drug also contains a small proportion of a bitter principle, which has not yet been examined.

Resin of Convolvulus Althæoides. N. Georgiadès. (*Journ. de Pharm.* [6], x. 117–119.) The roots of *Convolvulus althæoides* contain about 7 per cent. of a greenish-yellow resin which is insoluble in water. The resin is rendered partially soluble in water by the action of cold sulphuric, hydrochloric, or nitric acids, but no coloration is produced. It is decomposed by dilute acids, and a soluble reducing substance is formed. It is therefore probably composed of glucosides. As *C. althæoides* is very common in Syria and hence easily obtainable, the author suggests that this resin might find a place among therapeutic agents as a substitute for the more costly scammony or jalap resins.

Elemi and Allied Resins. K. Dieterich. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 200.) The author divides these drugs as met with in commerce into the following three classes:—

I. Genuine elemi, both hard and soft.

Manila elemi, generally soft, seldom hard, derived from *Icica icicariba.*

Yucatan, American or West Indian elemi, generally hard when found in commerce, seldom soft, obtained from *Canarium commune* and *Amyris Plumieri.*

The following kinds are found only in hard gum :—

Mexican or Vera Cruz elemi obtained from *Amyris elemifera.*

Rio elemi from various kinds of *protium.*

Brazilian (Almessega) elemi, from *Protium heptaphylum.*

African elemi, from *Canarium zephyricum.*

II. Gums resembling elemi.

a. With an odour similar to that of elemi and closely related to it.

East Indian takamahak, from *Calophyllum inophyllum.*

Bourbon takamahak, from *Calophyllum tacamahaca.*

Anime, West and East Indian, from unknown species of *Burseraceæ.*

b. With an odour of olibanum, which they resemble.

Cayenne incense, from *Icica heptaphylla.*

Gomart resin (also known as mastic) from *Bursa gumifera.*

Resin of occumé, from West African *Burseraceæ.*

West Indian takamahak, from *Icica heptaphylla.*

III. Resins differing from genuine elemi both in odour and external appearance.

Caranna resins, from *Icica caranna.*

Kikekunemalo and hyowae resins, from unidentified *Burseraceæ.*

Hedwigia resin, from *Hedwigia balsamifera.*

Copal, from *Darryodia hexandra.*

The Manila elemi is the kind which is most generally found in commerce. Next to this in point of frequency of occurrence is that from Yucatan. The chemical characteristics of Manila elemi have hitherto not been studied. This contains 25 per cent. of amyrin, $C_{25}H_{42}O$, 10 per cent. of ethereal oils (dextro-rotatory phellanderæ, $C_{10}H_{10}$ and dipenteræ), small quantities of elemic acid, $C_{35}H_{46}O$, 65 to 70 per cent. of amorphous resin, brysidin, $C_{20}H_{58}O_3$, and bitter extractive. Amyrin is composed of two bodies, alpha and beta amyrin, of the formula, $C_{30}4_{49}OH$. The chemical composition of the other kinds of elemi has not yet been fully determined.

The solubility, acid and saponification numbers of the commercial varieties serve for their identification. The saponification number is obtained by boiling for half an hour with semi-normal potash solution, since it has been found that this resin is not saponifiable

in the cold, as are other resins. The ash is very small, more than 1 per cent. not being allowable. The genuine drug possesses a very low acid and saponifying number. The slight solubility in solutions of alkali shows that large quantities of acid or ester like bodies are not present. The resin is soluble in ether, alcohol, carbon bisulphide, chloroform, benzol and 80 per cent. chloral hydrate solution. It is much less soluble in petroleum ether.

Valuation of Thapsia Resin. K. Dieterich. (*Pharm. Centralh.*, xl. 257-261.) This resin, which has considerable application in Continental medicine as a vesicant, is rarely met with in commerce in a state of purity. A rough, but efficient, though somewhat inconvenient method of determining the efficacy of the drug consists in the application of a small particle to the skin; the vesication produced differs from that excited by cantharides, consisting of small red, eczematous blisters, rather than one large blister. To determine the value of the resin, and at the same time to avoid the inconvenience arising from the presence of the blistering principle, the following scheme of analysis is suggested :—

(*a.*) Determination of the proportion of matter soluble in petroleum ether.
(*b.*) Saponification number of the portion soluble in petroleum spirit calculated to 1 gramme.
(*c.*) Determination of the proportion soluble in alcohol.
(*d.*) Determination of the proportion insoluble in alcohol.
(*e.*) Saponification number of the proportion soluble in alcohol calculated to 1 gramme.
(*f.*) Total saponification number of the resin.
(*g.*) Determination of water.
(*h.*) Determination of ash.

Full details of the method adopted are given in the paper. Genuine specimens of the drug were found to give the following limits and average figures :—

—	Limits.	Averages.
	Per Cent.	
(1) Water	7·43 to 10·336	9·0
(2) Ash	0·16 to 0·415	0·3
(3) Soluble in petroleum ether	19·28 to 25·67	22·5
(4) Saponification number of 3	251·94 to 360·18	305·0
(5) Soluble in alcohol	83·46 to 89·32	86·5
(6) Saponification number of 5	367·86 to 405·55	386·0
(7) Insoluble in alcohol	0·0 to 2·4	1·2
(8) Total saponification number	336·0 to 384·0	360·0

The results obtained with commercial specimens show a wide divergence from these figures.

Discrimination of Amber from Copal. O. Rössler. (*Archiv der Pharm.*, ccxxxvii. 239.) When a fragment of amber is heated in an ignition tube, the vapours evolved blacken lead acetate paper; this is not the case with copal. Judged by this test, the trinkets found at Troy and Mycenæ are found to be carved out of amber, and not out of fossil copal.

Piralahy Caoutchouc. (*Comptes Rendus*, cxxix. 349. From *Pharm. Journ.*) Piralahy or vahaelahy rubber is the product of a new species of *Landolphia*, named *L. perieri* by H. Jumelle. It is a native of the forests of Madagascar. The caoutchouc is described as being of excellent quality, containing but 5·5 per cent. of resin. The latex is obtained by the natives by cutting the climbing stems and allowing them to drain into suitable vessels, then coagulating it with lemon juice or crushed tamarind fruit. During the dry season but little sap is obtained, but this coagulates spontaneously; during the rainy season it is much clearer, but gives but little caoutchouc, only about 6 per cent. of the juice. The latex has a sp. gr. of 0·996, which is lower than that of most rubber-producing plants. The density of the dry caoutchouc is 0·910 whereas that of Para rubber is 0·920. The latex contains but little solid matter besides caoutchouc, neither starch nor sugar being present. The whole of the caoutchouc is not coagulated on boiling, nor is it readily precipitated by alcohol. Acids, and most salts, such as sodium chloride and magnesium sulphate, which do not coagulate ordinary rubber, at once precipitate the caoutchouc of *Landolphia*.

Gutta-Percha from Eucomia Ulmoides. MM. Dybowski and Fron. (*Comptes Rendus*, cxxix. 558-560.) The authors have examined a specimen of *Eucomia ulmoides* in the Paris Colonial Garden. The fresh leaves contain 70 per cent. of water, and, after drying, yield about 2¼ per cent. of their weight (0·7 per cent. of the fresh leaves) to toluene. The fruit (200 weighing from 13 to 15 grammes), undried, yielded about 27 per cent. of its weight. The product is brown, showing a metallic lustre; it softens in hot water, and can then be drawn out into films like goldbeaters' skin, or made to take the impress of a medal, and, on cooling, it again hardens. It is pronounced by a technical authority to be gutta-percha of good quality.

The plant from which the authors' samples were obtained came from the north of China, and has borne Parisian winters, so that

it may apparently be grown in temperate climates. It does not readily germinate from seed, but can be easily propagated by cuttings.

Palo Balsam. E. Petzold. (*Pharm. Centralh.*, 1899, No. 48.) Palo balsam is a product of *Bulneria Sarmienti*, nat. ord. *Zygophyllaceæ*, a plant indigenous to the Argentine Republic. Its chief constituents are the same as those occurring in guaiac resin, a large proportion of volatile oil, guaiagutin, and an acid of an aromatic odour which is not identical with guaiacic acid.

Surinam Copaiba. (*Pharm. Centralhalle*, xl. 503. From *Pharm. Journ.*) According to Pool, *Copaifera guianensis* and other copaibas yield a clear yellow, not opalescent, balsam, having the consistence of olive oil, known in commerce as Surinam copaiba. The balsam has a sp. gr. at 15° C. of 0·942, and is miscible with petroleum ether, ether, chloroform, and carbon bisulphide in all proportions, and with absolute alcohol in 4 or 5 parts. Its saponification number = 34. One gramme of the balsam combines with 94 milligrammes of iodine. The balsam yields 78 per cent. of a colourless volatile oil, having a sp. gr. of 0·910, boiling at 250°–260° C.; after the distillation of the oil a hard residue remains, from which copaibic acid is obtained by treatment with dilute alcohol, forming crystals which melt at 130° C. It is distinguished from similar copaiba balsams by its solubility in petroleum ether. A carbon bisulphide solution of the original balsam gives, with a mixture of equal parts of sulphuric and nitric acids, a brown-red, not a violet colour. It affords a clear solution with one-third of its volume of ammonia. Bromine, in 20 parts of chloroform, gives with the balsam a fine violet colour; lead acetate does not throw down a precipitate. The volatile oil gives with the above bromine chloroform mixture a bright red colour, with concentrated sulphuric acid, a brown, and with chloral hydrate, on warming, a green colour; it does not react with iodine, but evolves heat with chromic acid.

The Rarer Copaiba Balsams and Allied Substances. K. Dieterich. (*Pharm. Journ.*, 4th Series, x. 227–228, from *Pharm. Centralh.*, xl. 311.) Angostura, Bahia, Cartagena, Maracaibo, Maturin, East Indian (Gurjun), Para, West African (Illurin), and Mecca balsams have been examined. The method of analysis adopted was as follows:—

(1) *Determination of acid number.*—One gramme of balsam is dissolved in 30 c.c. of strong alcohol and titrated with semi-normal

alcoholic potash with phenolphthalein as indicator. The number of c.c. semi-normal K O H × 28 = acid number.

(2) *Determination of saponification number.*—One gramme of balsam is treated in a flask with 20 c.c. of semi-normal alcoholic potash and 50 c.c. of petroleum ether (boiling point, 60–70° C.). This is allowed to stand for 24 hours at ordinary temperatures and then titrated, after dilution with strong alcohol (not with water), with semi-normal $H_2 S O_4$, phenolphthalein being the indicator used. The number of c.c. semi-normal K O H used up × 28 = saponification number.

(3) *The ester number* is obtained by subtracting the acid number from the saponification number.

The following are the results obtained :—

ANGOSTURA BALSAM, three samples.

	(1)	(2)	(3)
Acid number	79·52 80·70	75·87 76·32	83·00 83·50
Ester „	16·24 17·38	16·07 16·19	8·36 7·84
Saponification number	95·76 98·08	91·94 92·51	91·36 91·44

BAHIA BALSAM, two samples.—The first was undoubtedly pure, the second probably adulterated.

	(1)		(2)	
Acid number	64·19	64·25	81·09	81·27
Ester „	1·76	2·60	5·08	6·05
Saponification number	65·95	66·85	86·17	87·23

CARTAGENA BALSAM, three samples.

	(1)		(2)		(3)	
Acid number	49·00	49·4	62·30	62·67	87·75	88·23
Ester „	56·20	57·17	41·15	40·90	4·55	4·67
Saponification number	105·20	106·57	103·45	103·57	92·30	92·90

MARACAIBO BALSAM, two normal samples and one (3) five years old.

	(1)		(2)		(3)	
Acid number	91·10	92·43	77·16	77·30	90·82	92·03
Ester „	7·70	6·39	9·85	11·08	18·26	17·59
Saponification number	98·80	98·82	87·01	88·38	109 08	109·62

MATURIN BALSAM.

	(1)	(2)
Acid number	78·52	82·73
Ester „	12·86	9·19
Saponification number	91·38	92·02

East Indian (Gurjun) Balsam, two samples.

	(1)		(2)	
Acid number . . .	10·8	10·98	10·64	10·77
Ester „ . . .	14·00	14·37	14·83	15
Saponification number .	24·80	26·35	25·47	25·77

Para Balsam, two samples.

	(1)		(2)	
Acid number . . .	49·47	49·92	61·62	61·82
Ester „ . . .	15·15	18·06	9·06	8·89
Saponification number .	64·62	67·98	70·68	70·75

West African (Illurin) Balsam, one sample.

Acid number	58·74	59·33
Ester „	9·62	9·62
Saponification number . .	68·36	68·95

Mecca Balsam.—Two samples were examined, the first pure and fresh, the second old and resinified, smelling of turpentine.

	(1)		(2)	
Acid number . .	39·84	39·96	60·77	61·37
Ester „ . .	101·10	101·39	81·90	82·66
Saponification number	140·94	141·35	144·67	145·03

The first balsam was a very thin fluid of very pleasant odour, and clear yellow colour, the second was a cloudy, thick fluid, and had an unpleasant turpentine odour.

Copaiba. Gehe & Co. (*Pharm. Centralh.*, xl. 269.) The authors dispute the value of some of K. Dieterich's figures for copaiba (see preceding abstract), and assert that the data obtained by the latter's method of examination yield results which would pass as pure, Para and Maracaibo balsams adulterated with 20 to 40 per cent. of colophony. They point out that it is not so much East Indian balsam, as the thin fluid Para copaiba balsam, which is used for the adulteration of Maracaibo balsam. They give the following comparative figures:—

	Sp. gr.	Acid No.	Ester No.	Sap. No.
Balsam Copaiba Para (pure) . .	0·931	30·32	8·11	38·43
With 20 per cent. Colophony . .	0·956	55·11	7·44	58·55
„ 35 „ „ „ . .	0·973	70·94	5·8	76·02
„ 40 „ „ „ . .	0·982	77·73	2·27	80·00

While the figures given by Dieterich are:—

	Sp. gr.	Acid No.	Ester No.	Sap. No.
For Para balsam	0·95 to 0·97	40–60	2–8	30–60
For Maracaibo balsam . . .	0·98 to 0·99	75–85	3–6	80–90

Balsam of Tolu. J. Spilsbury and T. G. Joyce. (*Pharm. Journ.*, 4th series, x. 93–94.) Although the authors confirm the statement of Braithwaite, that treatment with carbon bisulphide and the determination of the amount and saponification number of the matter removed by that solvent will differentiate between spurious and genuine Tolu balsam, they point out that this method will not suffice for the detection of "exhausted" balsam, which has been treated with water. They suggest that instead of expressing the amount of potassium hydrate consumed by the residue soluble in carbon bisulphide as parts per thousand of the residue, it would be better to calculate the amount of the alkali consumed into its equivalent of cinnamic acid, and record it in parts per hundred of the balsam. The number of samples examined by them is not as yet sufficient to permit the fixing of a minimum limit of cinnamic acid, but the experiments thus far show that this should probably not be lower than 18 per cent.

Peruvian Balsam. H. Thoms. (*Archiv der Pharm.*, ccxxxvii. 271–284. From *Journ. Chem. Soc.*) An undoubtedly genuine specimen of Peru balsam, collected personally by a traveller, was previously examined (see abstract, *Year-Book of Pharmacy*, 1899, 169), and specimens occurring in commerce are now found to have the same constituents. Vanillin can be extracted by shaking an ethereal solution of the balsam with a strong solution of sodium hydrogen sulphite. The ethereal solution can then be hydrolysed with alcoholic potash in the cold; by distilling the product with steam, the alcohols can be driven over, and from the non-volatile residue a substance melting at about 80° and possessing the character of a phytosterol can be isolated. The acids set free on acidifying the residual alkaline solution with hydrochloric acid were shown to consist chiefly of a mixture of benzoic and cinnamic acids, the latter being present to the extent of nearly 40 per cent. The last mother liquors yielded a small quantity of an acid that melted at 79–80°, and appeared to be a *dihydrobenzoic acid*. The mixture of alcohols was fractionated under diminished pressure; benzylic alcohol was obtained as the lower boiling fraction, and a new alcohol, *peruviol*, $C_{13}H_{22}O$, in much smaller amount, as a fraction boiling at 139–140° under 7 mm. pressure. This has a sp. gr. of 0·886 at 17·5°, and a rotation + 13° in a 100 mm. tube; it could not be made to yield an acetyl derivative in a pure state, but a *monocinnamoyl* derivative was obtained when it was heated with cinnamic chloride; it takes up 4 Br in acetic acid solution, and so is possibly a hydroaromatic compound with two double

linkings in the side chains; when it is oxidised with chromic acid in the cold, CH_2 appears to be replaced by O, which is an argument for the presence of a CH_2: group; when oxidised with alkaline permanganate, at first in the cold, it yields acetic acid together with propionic or possibly butyric acid, and a small quantity of a crystalline acid not volatile with steam.

No iso- or allo-cinnamic acid, or any cinnamylic alcohol (styrone) could be detected in the balsam.

Origin of Storax. J. Moeller. (*Centralbl. für Bakteriologie und Parasitenkunde*, 2te Abth., v. 412. From *Pharm. Journ.*) In his investigation of the origin and development of storax, the author has determined that this balsam is not produced in the bark, but is formed in the wood; that it is not a physiological secretion, but a pathological product which arises after damage to bark or wood. The first effect of a wound is the development of schizogenous glands which are subsequently converted into lysigenous spaces. These facts were verified both for styrax liquidus from *Liquidambar orientalis*, and for sweet gum from *L. styraciflora*. In both cases the balsam does not exist in normal plants; it was found only after the tree was wounded. Circular cuts were made in a tree of *Liquidambar styraciflora* six metres high. When the branches were not wounded there was no trace of balsam, but where the damage had affected the cambium, rows of balsam glands could be detected with a lens. There seems, therefore, no doubt that storax is a pathological product.

Camphor as a Tænicide. M. Besser. (*Therap. Monatsh.*, 1899, 632.) A case is reported in this paper in which the inadvertent administration of a tablespoonful of spirit of camphor caused the complete expulsion of a tapeworm (*Tænia solium*) within 2½ hours, without causing any pain or ill effects whatever.

Notes on Essential Oils. Schimmel & Co. (*Geschäftsber.*, October, 1899. From *Journ. Chem. Soc.*) There are two kinds of commercial oil of citronella, differing only slightly in physical properties and chemical composition. The ordinary oil "Lana Batu" contains less geraniol and citronellal than the better oil "Maha pangiri," which is richer in compounds capable of forming acetyl derivatives. A sample of the former oil having a sp. gr. of 0·908 at 15°, rotatory power −9°36′, and containing 61·1 per cent. of geraniol and citronellal, was found not only to contain camphene, dipentene, and limonene, but also two sesquiterpenes; the one boils and decomposes at 260–270° under the ordinary pressure, and at 157° under 15 mm. pressure, has sp. gr. 0·8643 at 15°,

rotatory power +1°28′, and refractive index 1·51849 at 15°, whilst the other boils at 272–275° under the ordinary pressure, at 170–172° under 16 mm. pressure, has sp. gr. 0·912 at 15°, and rotatory power +5°50′. The former terpene resinifies very easily, and this property explains the fact that, whilst many oils form clear solutions when dissolved in small quantities of 80 per cent. alcohol, they give turbid solutions when treated with four or more parts of the same alcohol.

The oil of citronella contained traces of linalool, about 1 per cent. of borneol and methyleugenol.

Another sample of citronella oil contained 33 per cent. of geraniol, 28 of citronellal, and 8 of methyleugenol.

The aqueous distillate obtained from oil of cumin contains methyl alcohol and furfuraldehyde. The yellowish colour of the former appears to depend on the presence of diacetyl; this is also the case with the methyl alcohol obtained from oil of cloves. The aqueous distillate of musk oil also contains furfuraldehyde.

About 9 per cent. of damascenine was extracted from nigella oil by shaking with tartaric acid and decomposing the tartrate with sodium carbonate; this compound has a blue fluorescence, solidifies in the cold, boils at 117° under 10 mm. pressure, and has a saponification number 277·4. From the alkaline liquid left after decomposing the tartrate, a fluorescent acid, probably an amido-acid, was isolated; it crystallises from ether in prisms, is easily soluble in water, and forms a slightly soluble platinichloride. The presence of methoxy-groups in damascenine was confirmed.

Mustard oil always contains carbon bisulphide, hence the determinations of sulphur do not exactly correspond with the amount of allylthiocarbimide present.

The fresh flowering plants and the roots of *Viola tricolor*, when distilled, yield 0·00859 per cent. of an ethereal oil, which consists mainly of methyl salicylate.

Empyreumatic Oil of Juniper. M. Cathelineau and J. Hausser. (*Bull. Soc. Chim.*, xxi. 378–380.) The author has examined the constituents extracted from this oil by amylic alcohol, and finds that these consist mainly of phenolic ethers of resinous compounds.

Oil of Neroli and Oil of Petit Grain. E. Charabot and L. Pillet. (*Bull. Soc. Chim.*, xix. 853–857. From *Journ. Chem. Soc.*) In view of sundry discrepancies between the observations of previous experimenters, the authors have themselves distilled and examined nine specimens of oil of neroli and eight of oil of

petit grain, a common adulterant of the former. The results obtained may be summarised as follows :—

	Oil of neroli.	Oil of petit grain.
Sp. gr. at 15°	0·872–0·876	0·891–0·894
Rotation per 100 mm. at 15° .	+1·42–4·06°	−4·45–6·00°
Index of refraction n_D at 18–21°	1·470–1·4745	—
Ethereal salts calculated as $C_{10}H_{17}\cdot OAc$, per cent. . .	10·1–18·0	51·5–69·6
Parts of 80 per cent. alcohol required for solution at 20° .	1·3–1·55	·1–1·1

One of the specimens of oil of neroli was insoluble in alcohol; the solubility appears to diminish with age. The difference in the rotatory powers of the two oils is shown by fractional distillation to be due to the fact that oil of neroli contains a larger proportion of dextro-rotatory terpene and a smaller proportion of alcohols than does oil of petit grain. The alcohols, linalool and geraniol, contained in the two oils are qualitatively identical, although their relative proportions and the nature of the acids with which they are partially combined are different. It is to the ethereal salts present that the characteristic odours of the oils are due, since after hydrolysis both are found to possess a similar odour, recalling that of linalool.

Oil of Neroli. H. Walbaum. (*Journ. prakt. Chem.*, lix. 350–352.) By shaking French oil of orange-blossoms with 30 per cent. sulphuric acid, a basic substance was obtained which proved to be the methyl salt of anthranilic acid; it was also isolated from oil prepared by Schimmel & Co. from orange-blossoms which had been preserved in salt.

The substance was obtained as a colourless oil which gradually solidified. The crystals have a blue fluorescence, a property which is also exhibited in a marked degree by the alcoholic solution. The odour of the undiluted substance is not pleasant, but that of dilute solutions recalls that of orange-blossoms. It is easily prepared synthetically by the action of methyl alcohol and hydrogen chloride or sulphuric acid on anthranilic acid, and the synthetical substance has the same properties as the naturally occurring compound. It boils at 132° under a pressure of 14 mm., has a sp. gr. of 1·168 at 15°, melts at 24-25°, and resolidifies at 24°.

The Purity of Oil of Bergamot. A. Soldaini and E. Berté. (*Zeitschr. für Unters. der Nahr und Genussm.*, vi. 537. From *Pharm. Journ.*) According to the authors, during fractional distillation of bergamot oil the dextro-rotation of the oil becomes less and less until after half the oil is distilled, when it becomes nega-

tive. In bergamot oil adulterated with 2 per cent. turpentine, the dextro-rotation of the first fraction is less than that of a pure oil. In the second fraction the rotation is the same as that of a pure oil. The authors arrive at the following conclusions:—By distilling 15 or 20 c.c. of pure bergamot oil *in vacuo* under 20 mm. pressure the optical rotation of the first fraction (one-third of the original oil) varies from +35 to +45, and a very slightly optically active residue (under +1°) is obtained. If a bergamot oil contains lemon oil, and the optical rotation of the distillate is less than +40 c.c., turpentine is also present. If from 15 c.c. of the pure oil 10 c.c. be distilled off, the residue will give a slight lævo-rotation, but with an oil adulterated with 5 or 2·5 per cent. of lemon oil, or as much turpentine, the rotation will be to the right; the presence of lemon oil may be confirmed by Schiff's reaction. If the oil gives a fraction of higher rotation than +45, the presence of lemon oil is established. In both the latter cases the optical rotation of the residue will be over +2.

Assay of Oil of Lemon. J. Walther. (*Chem. Centr.*, 1899, ii. 942, 943. From *Journ. Chem. Soc.*) The amount of citral and citronellal contained in lemon oil is determined by converting them into oximes by means of hydroxylamine hydrochloride and then titrating the excess of this compound. A 20 per cent. solution of hydroxylamine hydrochloride in 80 per cent. alcohol is titrated, first using methyl-orange and then phenolphthalein as indicator. An equal volume of the same solution is boiled with about 10 grammes of lemon oil and 0·5 to 1·0 gramme of sodium hydrogen carbonate for 45 minutes. Hydroxylamine hydrochloride may be heated with the carbonate in presence of an indifferent liquid such as alcohol or turpentine without loss. The cooled solution is made up to 250 c.c. and 25 c.c. are titrated with hydrochloric acid using methyl-orange; then back again with decinormal sodium hydrate solution, and finally again with alkali in presence of phenolphthalein. The percentages of citral c, or of citronellal c', may be calculated from the formulæ $c = \frac{1{\cdot}52a}{g}$ and $c' = \frac{1{\cdot}54a}{g}$ in which a = c.c. of decinormal sodium hydrate solution used, and g = weight of oil taken. By this method, lemon oil was found to contain only 5 per cent. of citral, whereas, according to Schimmel & Co., 7 to 8 per cent. is the usual amount. In order to avoid a large excess of hydrochloric acid, as little sodium hydrogen carbonate as possible should be used in the titration of hydroxylamine; the oximes are hydrolysed by an excess of acid, forming ammonium citronel-

late and geraniate respectively, and these salts interfere with the titration.

The results were controlled by the following method. After forming the oximes, the product is made up to a certain volume, the oil separated, and the aqueous solution filtered. To 25 c.c. of the filtrate, after treating with 1 gramme of sodium hydrogen carbonate, decinormal iodine solution was added, and the excess finally titrated with thiosulphate solution. 1 c.c. of iodine solution corresponds with half a molecule of hydroxylamine.

Oil of Thyme. H. Labbé. (*Bull. Soc. Chim.*, xix. 1009-1011.) From oil of thyme, 30 per cent. of thymol was extracted by treatment with aqueous potash, and the insoluble portion of the oil, on fractional distillation, yielded: (1) 17 per cent. of a hydrocarbon boiling at 156–158°, which differs from pinene in forming a nitrosochloride melting at 106·5° and not yielding a hydrochloride; (2) 15 per cent. of menthene; (3) 21 per cent. of cymene; (4) 5 per cent. of linalool; (5) 8 per cent. of borneol; and (6) 4 per cent. of a residue boiling above 230°, and including, among other products, a small quantity of carvacrol.

Composition of Monarda Oils. E. Kremers and W. E. Hendricks. (*Pharm. Arch.*, 1899, ii. 73–78.) The oil distilled from *Monarda punctata* contains about 60 per cent. of phenols, consisting mainly of thymol, a little carvacrol sometimes being present. About 10 per cent. of the remainder is an alcoholic compound, the rest, which boils at 170–180°, consisting of cymene and a small quantity of dextrorotatory limonene.

Monarda fistulosa yields an oil containing cymene, carvacrol, and limonene; if thymol is present, its amount must be less than 2 per cent. of that of the carvacrol.

Eucalyptus Oils. R. T. Baker and H. G. Smith. (*Pharm. Journ.*, 4th series, ix. 315.) The authors have continued their researches on the essential oils of the "stringy bark" eucalypti, which include *E. baileyana*, *E. eugenioides*, *E. fastigiata*, *E. macrorhyncha*, and *E. obliqua*. *E. eugenioides*, or White Stringy Bark: The crude oil contains 28·4 per cent. of eucalyptol, and the second fraction 34·8 per cent., but no phellandrene; no eudesmol or other constituent of special interest was noted. The percentage of oil was 0·6 to 0·7 per cent. *E. capitellata*, or Brown Stringy Bark: The second portion of oil yielded 38·4 per cent. of eucalyptol, a mere trace of phellandrene, and very little, if any, eudesmol. *E. macrorhyncha*, or Red Stringy Bark: The authors consider this to be the most important commercial tree of the whole genus.

The percentage yield of oil is about 0·28 to 0·31, and of eucalyptol in the oil 50 per cent.; it contains only a trace of phellandrene. It contains also, in large quantity, a stearoptene, especially when the oil has been distilled in November; a crystalline body called eudesmol, which represents the fraction boiling between 269° and 289° C., and forms about 27 per cent. of the original oil. This appears to interfere with the estimation of eucalyptol by the phosphoric acid process in the crude oils. The oil of *Eucalyptus macrorhyncha* answers all the tests of the B.P., except sp. gr., which is 0·905 at 18° C. The authors point out that if the sp. gr. is enforced it will exclude the use of this oil, which is an excellent and agreeable oil, containing half its weight of eucalyptol. Eudesmol is left as a crystalline substance when the oil evaporates, but it will not crystallise out when the oil is subjected to a temperature of 10° below zero. The crystals are acicular, and polarise light extinguishing parallel to the principal axis, and so are probably rhombic. They have a melting point of 74-75° C. The boiling point is 270-272° C., so that it usually remains with the residue in the retort. Its therapeutic properties are being investigated. *E. piperita*: It was in this oil that eudesmol was first observed, forming a crystalline deposit on the cork of the bottle containing it. The yield of oil is 0·78 per cent. The oil rectified below 190° C. is free from eudesmol; the fraction between 170° and 190° C. contains phellandrene and only 25 per cent. of eucalyptol. *E. punctata*: This tree yields an average of 0·79 per cent. of oil, which contains from 50 to 60 per cent. of eucalyptol in the crude oil. It does not contain phellandrene, but traces of cuminic aldehyde. It appears to contain both dextro- and lævo-rotatory terpenes, which vary in proportion, apparently according to the age of the leaves. The constituents of the eucalyptus oils do not appear to vary much in the same species, but the proportions vary according to the time of year at which the leaves are collected.

Oil of Poplar Buds. F. Fichter and E. Katz. (*Ber. der deutsch. chem. Ges.*, xxxii. 3183–3185.) The principal fraction obtained by distilling oil of poplar buds under diminished pressure is a terpene boiling at 132-137° under 13 mm. pressure, and at 263–269° under ordinary pressure; it has a specific gravity of 0·8926 at 15°, and a specific rotatory power 10° 48′ at 22°; its vapour density corresponds with that of a sesquiterpene, $C_{15}H_{24}$.

The higher fractions of poplar oil contain a mixture of paraffins, "stearoptenes," consisting of the hydrocarbon $C_{24}H_{50}$ and its

higher homologues; the total amount of paraffin in the oil is only ½ per cent.

Volatile Oil of Liquorice. H. Haensel. (*Pharm. Centralh.*, xl. 533.) By distilling Spanish liquorice root (*Glycyrrhiza glabra*), 0·03 per cent. of an essential oil was obtained; the Russian roots yielded 0·035 per cent. These oils have a feeble acid reaction, which is possibly due to glycyrrhizic acid, but their composition is not identical, for whilst the Russian oil is dextrorotatory, the Spanish is lævorotatory.

East Indian Sandalwood Oil. H. von Soden and F. Müller. (*Pharm. Zeit.*, xliv. 258-269.) Sandalwood oil has been stated to consist mainly of santalol, a sesquiterpene alcohol, $C_{15}H_{25}\cdot OH$, boiling at above 300°. Santalol contains, however, at least two different alcohols, of which the one of lower boiling point is slightly lævorotatory or inactive, whilst the other has a rotatory power of about −20-30°. The mixture boils at about 303-306°, and both alcohols have the same specific gravity. Heine & Co.'s *gonorol* is prepared from the mixture by hydrolysing and fractionating in a vacuum. A sesquiterpene, *santalene*, $C_{15}H_{24}$, prepared by hydrolysing and then fractionating the oil, is a thin, colourless oil which has the odour of cedar, boils at 261–262°, has a sp. gr. of 0·898 at 15°, a rotatory power of about −21°, is soluble in 16 parts of 90 per cent. alcohol, and is easily so in chloroform, ether, benzene, or light petroleum. It combines with hydrogen chloride or bromide (2 mols.) to form volatile additive products, and when treated with glacial acetic acid or sulphuric acid and a small quantity of water, yields a liquid which is probably the sesquiterpene alcohol, $C_{15}H_{26}O$; this has a strong, cedar-like odour, boils at 160–165° under 6 mm. pressure, and has a sp. gr. of 0·978 at 15°.

Sandalwood oil also contains small quantities of phenols, lactones, and borneol. An acid which melts at about 154° was also isolated.

The Composition of East Indian Sandalwood Oil. M. Guerbet. (*Comptes Rendus*, cxxx. 417–420. From *Journ. Chem. Soc.*) A specimen of oil of sandalwood from Bombay was of a pale yellow colour and oily consistence, and had a sp. gr. of 0·9684 at 0° and a rotatory power $[\alpha]_D$ −21·1°. It contained 90·1 per cent. of alcohols calculated as $C_{15}H_{26}O$, and esters corresponding with 7 milligrammes of potassium hydrate per 1 gramme of the oil; no free acid or base was detected. The following compounds were isolated from the oil: (1) Two isomeric sesquiterpenes: *α-santalene*, boil-

ing at 252–252·5°, and having a sp. gr. of 0·9134 at 0°, and a rotatory power $[\alpha]_D$ −13·98°; and *β-santalene* boiling at 261–262°, and having a sp. gr. of 0·9139 at 0°, and a rotatory power $[\alpha]_D$ −28·55°. Both are colourless, oily liquids of feeble odour. β-Santalene has previously been isolated by Soden and Müller (see preceding abstract). (2) A mixture of alcohols, $C_{15}H_{26}O$, distilling at 183–197° under 37 mm. pressure and having rotatory powers ranging from $[\alpha]_D$ −9·4° to $[\alpha]_D$ −25·3°; this probably consists of α- and *β-santalols*, corresponding with α- and β-santalene. (3) An aldehyde, *santalal*, $C_{15}H_{24}O$, a colourless, oily liquid of strong pepper-like odour, and boiling at 180° under 40 mm. pressure; it forms a *semicarbazone* which crystallises in small needles melting at 212°. (4) *Santalic acid*, $C_{15}H_{24}O_2$, a colourless, viscous liquid which boils at 210–212° under 20 mm. pressure and is insoluble in water; the *potassium*, *sodium*, and *barium* salts are crystalline compounds which are decomposed by carbon dioxide. This acid is also formed when santalal is oxidised with chromic acid in acetic acid solution. (5) *Teresantalic acid*, $C_{10}H_{14}O_2$, crystallises from alcohol in large, colourless prisms melting at 157° and boiling at 183° under 28 mm. pressure. The *potassium* salt was obtained as a nacreous, crystalline mass; the *calcium* salt crystallises with $2H_2O$. (6) 0·2–0·3 per cent. of odorous substances, which could not be obtained in the pure state; small quantities of acetic and formic acids were also found.

The following is given as the approximate composition of the oil:—

Santalenes α and β	60
Santalols α and β	800
Santalal	30
Acids in the state of esters (formic, acetic, santalic, teresantalic)	30
Undetermined strongly odorous bodies boiling at 130° to 220°	3
Undetermined products boiling about 320° (hydrocarbons, alcohols, ethers, resinous products)	77
	1,000

The author is still engaged in the study of the santalenes and santalols.

Oil of Lavender obtained from the Plant at Different Stages. E. Charabot. (*Comptes Rendus*, cxxx. 257–259.) An examination of three samples of oil of lavender taken from the plant at the budding, flowering, and fading stages shows that the specific

gravity and optical activity of the oil increase, and the amount of free acid present decreases, as the plant attains maturity. The maximum quantity of esters is obtained from the plant when in flower, and the amount present in the oil from the specimens with faded flowers is greater than that extracted from the young plant. The proportion of alcohol, whether free or combined, diminishes until the flowers have blossomed, and at the same time the relative amount of esters increases; the oil from the mature plant with faded flowers, however, contains more alcohol and less esters.

These results seem to indicate that during development the esters are produced by the direct action of the acids on the linalool, and that during this period a portion of the alcohol is dehydrated; when the flowers begin to wither, esterification ceases; and then the proportion of total alcohol increases. The formation of esters and terpenes, which takes place in the green parts of the plant, is probably due to chloryphyllous evaporation.

Oil of Peppermint. E. Charabot. (*Comptes Rendus*, cxxx. 518. From *Pharm. Journ.*) The author has investigated the formation of menthol and other constituents of peppermint oil during various stages in the development of the peppermint plant. The oils examined were derived from plants at three different stages of growth; the first as soon as the inflorescence appeared, and before the formation of flower buds, the second when flower buds were formed, the third when the flowers were fully expanded.

	Before formation of flower buds.	After formation of flower buds.		Flowering plants.
		(*a*) leaves	(*b*) inflorescences.	
Sp. gr. at 18° C.	0·9025	0·9016	0·9081	0·9200
Opt. rot. at 18° C.	− 24° 10′	− 26°	− 20° 15′	− 2° 37′
Esters (as menthyl acetate)	3·7 per cent.	10·3 per cent.	7·5 per cent.	10·7 per cent.
Combined menthol	2·9 „ „	8·1 „ „	5·9 „ „	8·4 „ „
Free menthol	14·3 „ „	42·2 „ „	29·9 „ „	32·1 „ „
Total menthol	17·2 „ „	50·3 „ „	35·8 „ „	40·5 „ „
Menthone	5·2 „ „	4·2 „ „	16·7 „ „	10·2 „ „

It will thus be seen that at the first stage the plant yields an oil rich in menthol, but containing a relatively small proportion of esters, and in which menthone is only present in small quantity; as, however, the development of the green parts of the plants

progresses, the proportion of esters increases, and this etherification takes place in the leaves, for when the oil passes from them towards the inflorescences, it becomes less rich in esters. Menthone, however, would appear to be chiefly formed in the flowers, where it increases during the development of the inflorescences, while the proportion of the total menthol diminishes. It is concluded therefore that, as in the case of lavender (see preceding abstract), etherification is confined to the chlorophyll-bearing parts, and that menthone is formed in the flowers by the oxidation of menthol.

Oil of Geranium. MM. Jeancard and Satie. (*Bull. Soc. Chim.*, 1900, 37–39. From *Journ. Chem. Soc.*) Six specimens of essential oil of geranium obtained from Cannes, Spain, Corsica, Africa, Réunion, and India respectively were examined with the following results. Sp. gr. at 15°, 0·8905–0·9073; rotation per 100 mm. at 15°, −0·48° to −9·40°; acid number (milligrammes of K O H per 1 gramme), 9·6–56·0; saponification number, 43·0–74·0; esters as $C_{12}H_{20}O_2$, 6·65–11·30 per cent.; alcohols as $C_{10}H_{18}O$, 61·31–84·62 per cent. All the samples contained free acid, the amount of which was increased by exposure to the air. The solubility of the oils in alcohol was nearly constant, 1 vol. being dissolved by 0·9–1·0 vol. of 80 per cent. alcohol, or 2–2·3 vols. of 70 per cent. alcohol, at 15°.

Oil of Chrysanthemum Japonicum. G. Perrier. (*Bull. Soc. Chim.*, xxiii. 216–217.) The green leaves of *Chrysanthemum japonicum*, when distilled with water, yield about 0·16 per cent. of a greenish, somewhat oily liquid, having an odour recalling mint and camomile, which boils at 160°, and has a sp. gr. of 0·932 at 15° and refractive index 1·4931 at 18°. It is almost insoluble in 70 per cent. alcohol, but soluble in 10 parts of 95 per cent. alcohol; when cooled to −15°, it deposits a small quantity of an amorphous solid, probably a paraffin, and at a still lower temperature it completely solidifies. The essence has an acid reaction, partially combines with sodium hydrogen sulphite, and has a saponification number 8·61; the products of hydrolysis seem to include angelic acid.

Otto of Orris. J. C. Stead. (*Chemist and Druggist*, lvi. 472.) The author has succeeded in freeing this otto from the myristic acid to which its solidity is due, and he thus obtains from each five parts of the concrete otto one part of transparent and fluid otto. It is of a golden-yellow colour, and has a powerful and persistent smell, but on extreme dilution the delightful odour of

violets is obtained. Its taste is bland, but it has a bitter after-taste. The otto is soluble in all proportions of ether, alcohol, chloroform, petroleum-ether, and benzene. It requires eight times its volume of 70 per cent. alcohol to make a clear solution. It is acid in reaction towards litmus-paper, and on treatment with caustic-potash solution forms a milky mixture, from which a curd separates. It yields nothing when shaken with sodium acid sulphite solution, indicating the absence of aldehydes. On distillation at atmospheric pressure the oil decomposed. The following are the physical characters of the otto :—

Sp. gr. at 15·5° C.—0·9489.

Rotatory power in 100 mm.—28·25°.

Required for neutralisation—6·4 per cent. seminormal potassium hydrate.

After acetylising—17·76 per cent. ditto.

Congealing point—5° C.

Viscosity at 20° C. is 34·6, as compared with almond oil 100.

The author claims that this otto marks a distinct advance upon the concrete article hitherto alone obtainable.

Oil of Cascarilla. H. Thoms. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 200.) The author states that he has found about 1 per cent. of volatile oil in the bark of *Croton eluteria*. Trommsdorf first examined this oil in 1833, but his examination was confined to a study of its physical properties and of its behaviour with concentrated nitric acid. Trommsdorf's sample showed no acid reaction. A more thorough investigation of the oil was made by Voelckel in 1840. The sample now reported upon by the author was obtained from Schimmel & Co.

The specific gravity of the oil was 0·914 at 15° C., and 0·912 at 20° C. It showed an optical rotation of $[\alpha]_D = +4·81$ at 15° C. The percentage composition of the oil was found to be as follows :—

Free acid	2·10
Eugenol	0·30
Terpene (boiling point 155° to 157°)	10·00
Limonene, lævogyre	8·80
Para-cymol	13·20
Sesquiterpene, $C_{15}H_{24}$, bp, 255° to 257°	10·50
Sesquiterpene, $C_{15}H_{24}$, bp, 260° to 265°	33·00
Alcohol, $C_{15}H_{23}OH$, bp, 280° to 290°	11·00
Oxygenated portion with high boiling point	10·00
Resin	1·10
	100·00

The terpenes and the cymol can be separated from the sesquiterpenes and the higher boiling constituents of the oil through repeated distillation with absolute alcohol. On dilution of the alcoholic distillate with water, the terpenes separate as an oily layer. This method of separating the terpenes from the higher boiling constituents is very convenient, and should prove of value in the examination of other essential oils.

Oil of Savin. Schimmel & Co. (*Journ. Soc. Chem. Ind.*, xix. 556, from the authors' *Report*, April, 1900, 43–44.) A new constituent, either an aldehyde or a ketone, has been detected in savin oil, during the process of preparing sabinol, $C_{10}H_{16}O$. On fractionating the saponified oil, a portion boiling between 220–250° C. was noticed to have an odour resembling cuminal. This fraction formed a crystalline compound with bisulphite, from which the new constituent was liberated by means of soda. It then had an odour less like cuminal; boiled, under 26 mm. pressure, at 127–129° C., had the sp. gr. 0·9163 at 16° C., and was dextrogyre, + 11° 40′. It formed a crystalline phenylhydrazone, which, however, could not be recrystallised, owing to its solubility in most solvents and its instability. The oxime was more stable, crystallising from alcohol in broad needles melting at about 85° C. This body is under further investigation.

Assay of Oil and Spirit of Mustard. J. Gadamer. (*Archiv der Pharm.*, ccxxxvii. 372–378.) 2 grammes of the oil are mixed with 98 grammes of alcohol, and 5 c.c. (= 4·2 grammes) of the resulting spirit of mustard treated with 50 c.c. of decinormal silver nitrate solution and 10 c.c. of ammonia for 24 hours in a stoppered flask of 100 c.c. capacity, which should be frequently shaken. The contents of the flask are then diluted to 100 c.c., filtered, and 50 c.c. of the clear filtrate mixed with 6 c.c. of nitric acid and 1 c.c. of ferric ammonium sulphate solution, and then titrated with decinormal ammonium thiocyanate solution. Of the latter, not more than 17·15, and not less than 16·5, should be required to produce a red coloration. This corresponds to 1·852–2·000 per cent. of allylthiocarbimide in the spirit, or to 92·5 to 100 per cent. in the oil.

The Fatty Oil of Tropæolum Majus. J. Gadamer. (*Archiv. der Pharm.*, ccxxxvii. 471–474.) The crushed seeds of this plant yield to ether a fixed oil which solidifies on the evaporation of the solvent, but readily melts again on slight warming. It consists chiefly of tri-erucin, $C_3H_5(C_{22}H_{41}O_2)_3$, which melts at 30·5 C.

By treatment with nitric acid and potassium nitrite, this glyceride is converted into tri-brassidin, which, when crystallised from alcohol, melts at 54–55°. The oil also contains a small proportion of phytosterol.

Oil of Quince Seed. H. Thoms. (*Archiv der Pharm.*, ccxxxvii. 358.) Quince seeds contain about 15 per cent. of a yellow fixed oil, possessing the following characters :—Specific gravity, 0·922; acid number, 31·7; Koettstorfer number, 181·75; Hübl's iodine absorption number, 113; Reichert-Meissl number, 0·508; Hehner's number, 95·2. The oil contains the glycerides of two saturated fatty acids, one of which is identical with myristic acid, and also contains an unsaturated liquid fatty acid having a specific gravity of 0·893 and containing a hydroxyl group.

Oil of Maize. L. Archbutt. (*Journ. Soc. Chem. Ind.*, 1899, 346–347.) This fat, which belongs to the drying oils is found to possess the following characters :—Specific gravity, 0·9243 at 15·5°; absolute viscosity, 0·789 at 15·5°; Maumené test using acid containing 97 per cent. of hydrogen sulphate, 81·6°; saponification value, 18·97; iodine absorption figure, 122·7; unsaponifiable matter, 1·69 per cent., and free acid calculated as oleic acid, 2·4 per cent.

The Purity of Croton Oil. W. Dulière. (*Journ. de Pharm. d'Anvers*, lv. 294.) Pure croton oil should possess the following physical and chemical characters :—

Specific gravity, 0·9437 at 15° C., and 0·8874 at 100° C.

Solubility in 92 per cent. alcohol, 1:63.

Total acid number, 215·6.

Consistence of soap, soft.

Solidifying point of fatty acids, 16·4 to 16·7° C.

Reichert-Meissl number, 12·1.

Iodine absorption number, 100·37 to 101·91 in 2 hours; 103·63 to 104·30 in 12 hours.

Iodine absorption number of fatty acids, 111·23 to 104·39 in 2 hours.

Acetylation number, 38·64.

The foregoing numbers are practically the same for samples of croton oil obtained by cold expression or by extraction with ether or petroleum ether. The oil obtained by hot expression or by ether extraction from non-decorticated seeds, may differ in colour, in acidity and in solubility in alcohol, but responds to the chemical characters referred to.

The Purity of Cacao Butter. J. Lewkowitsch. (*Journ. Soc. Chem. Ind.*, xviii. 556–558.) The Reichert-Meissl value of cacao butter has been recorded as 3·52, but the author states that it varies from 0·20 to 3·83. The adulteration with large quantities of cocoa-nut oil or palm-nut oil may therefore be detected by the large increase of volatile soluble fatty acids.

An adulteration with tallow or similar fats is best detected by the presence of cholesterol, which is readily isolated and recognised microscopically.

Glycerin in the Treatment of Renal Concretions of Uric Acid (*Medical Chronicle*, January, 1900, and *Brit. Med. Journ.*, Feb. 17, 1900.) Herrmann has obtained favourable results in nephrolithiasis by the administration of glycerin by the mouth. He gave it in the first instance on theoretical grounds based on the facts that glycerin is a solvent of uric acid, and that when given *per os* it is excreted in large part with the urine. The good effects he has observed he does not now attribute to any solvent action of the glycerin on the uric acid, but to physical changes produced in the urine. When given in the large doses he employs, it causes the urine to become somewhat oily in consistence, and to its lubricating action he believes the good results are to be ascribed. Rosenfeld, who has also praised the method, believes it to give relief by raising the specific gravity of the urine and thereby producing a change in the position of the calculi in the pelvis of the kidney. It is given in quantities of from 1 to 4 ounces, dissolved in an equal quantity of water, and taken as one dose, between two meals, and repeated two or three times in a period of several days. He has used it in 115 cases of nephrolithiasis, and in 60 per cent. of these it proved efficacious either by removing concretions or by relieving the pain associated with the disease. Ortner and Kugler have confirmed the stone-expelling power of glycerin, while Casper and Rosenfeld speak of its anodyne effect as most striking. Given in the doses named, the only unpleasant effects observed were headache in 12 nervous patients, and diarrhœa in 3 cases where the digestive organs were not healthy. In all the 15 cases these effects ceased in the course of a few hours. In the case of such patients it is recommended that the initial dose should be smaller than the minimum dose named, and that it should be gradually increased. The presence of albuminuria does not contraindicate the employment of glycerin, the amount of albumin was never increased, and in one case, after three doses of the agent, the previous albuminuria completely dis-

appeared. In 6 cases of the 115 hæmaturia occurred, and this he ascribes to the concretions changing their position either spontaneously or owing to the glycerin.

Gelatin in Hæmaturia. M. Schwabe. (*Brit. Med. Journ.*, from *Therap. Monatsh.*, June, 1900.) The author records a case of recurrent nephritis with severe hæmaturia treated by the subcutaneous injection of gelatin as used by Carnot and Lancereaux for aneurism. He injected 25 c.c. of a 2 per cent. solution of pure gelatin in physiological saline solution beneath each clavicle. This was repeated next day, and followed by the oral administration of half a litre of 10 per cent. gelatin solution daily for a week. Although all previously tried hæmostatics had failed this line of treatment was speedily and permanently successful. The author states that the pain of the injections was quite bearable, and that the alarming after-effects described by Boinet, Barth, and others extensive thrombosis, gangrene, fatal emboli were entirely absent.

Lactic Acid in Irritant Skin Diseases. M. Du Castel. (*L'Union Pharm.*, xl. 199. From *Pharm. Journ.*) The author finds lactic acid to be an excellent means of allaying the intense itching of many skin diseases such as urticaria, prurigo, and other similar affections: the remedy is particularly successful with juvenile patients. It is given in the form of drops, from six to twenty, in sweetened water, according to the age of the patient. With adults as much as 1·5 to 2 grammes per diem may be given; with moderate doses no ill effects are observed even after prolonged use. The good effects in allaying the irritating itching were very marked in all those cases where digestive derangement exists.

The Alleged Toxic Action of Filicic Acid. M. Walko. (*Pharm. Zeitung*, 1900, 189. The toxic effects of extract of male fern, which have been repeatedly observed, have generally been attributed to the filicic acid contained in the extract. The author's investigation of this subject shows that this acid is to a great extent eliminated in an unchanged condition, and cannot therefore be regarded as possessing strong toxic properties. He considers it more probable that these properties of the extract are due to the aspidin and aspidinin contained therein.

Salicylic Acid as a Tænicide. M. Ozegonski. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 324. The author has successfully employed salicylic acid as a tænicide. He administers 1 ounce of castor oil in the morning, the patient having gone to bed fasting. On the next morning he gives half an ounce of castor

oil at 7 o'clock, followed by 8 grains of salicylic acid at 8, 9, 10 and 11 o'clock respectively. If the worm is not dislodged at the time the last dose is administered, another half ounce of oil is given.

Salol as a Tænicide. M. Galli-Valeris. (*Therapeut. Monatsh.*, 1900, No. 3.) The author finds that salol in doses of 1 gramme possesses the power of expelling tapeworms without producing any unpleasant symptoms.

Salol in Small-Pox. C. Begg. (*Brit. Med. Journ.*, 1900, 16.) The author advocates an extensive trial of salol in the treatment of small-pox. His personal experience is that this remedy abolishes all sense of irritation and the desire to scratch, and prevents the stage of maturation. He did not find it necessary to exceed one drachm a day given in 15-grain doses every four hours. No bad result was noticed even from long-continued use of the drug.

J. Biernacki and P. N. Jones confirm the value of this treatment. (*Brit. Med. Journ.*, 1900, 1337.)

Salicylic Acid for the Treatment of Boils. M. Philipson. (*Sem.-Med.*, 1899, No. 23. From *Amer. Drugg. and Pharm. Rec.*) The author recommends the local application of salicylic acid for the treatment of all kinds of boils. Large ones he covers with 50 per cent. salicylic acid plaster, which should be changed several times daily, so as to be able to free the boil from the accumulated pus at each change of dressing. For the latter purpose he recommends the use of a tampon moistened with a mixture of alcohol and ether. This treatment hastens the softening of the boil, and the core generally comes out within 24 hours after the beginning of the treatment. The application, which should be continued, hastens the granulation. Where the boil occurs on the face the author recommends that the centre be bored out with the point of the thermo-cautery and the hole packed with salicylic acid. Small boils may be aborted by touching the spot three times a day with a 2 per cent. solution of the acid in alcohol. When there is a pronounced tendency to furunculosis over a large area the surface should be first washed clean once a day and a 2·5 per cent. salve rubbed in.

Physiological Action of Acetylsalicylic Acid (Aspirin). H. Dreser. (*Pflüger's Archiv.*, 1899, 306–318.) This preparation, a previous reference to which will be found in the *Year-Book of Pharmacy*, 1899, 222, is easily split up by the gastric juice, or after absorption in the alkaline fluids of the body. Its action on the nervous system is not so irregular as that of sodium salicylate,

and it is stated to stimulate the heart instead of depressing it as the sodium salt does.

The Value of Piperazine in Gout. W. Fearnley. (*Brit. Med. Journ.*, 1899, 1792.) The author publishes some further experience confirmatory of the value of piperazine in the treatment of gout and uric acid diathesis. For particulars, reference should be made to the original paper.

Clinical Experience with Heroine. F. Meyer. (*Zeitschr. des oesterr. Apoth Ver.*, 1899, 814.) Much diversity of opinion has been expressed of late with regard to the advisability of using this morphine derivative as a respiratory sedative in the place of codeine or morphine. The author has tried this remedy extensively, and found it to be most useful in dyspnœa resulting from distressing coughs or from other pulmonary or cardiac troubles. He has also found it to be efficient for the relief of pain and sleeplessness in all cases in which it is expedient to avoid morphine, and has never observed any injurious action on the heart or any unpleasant secondary effect whatever. He regards 3 milligrammes as the best initial dose, and 5 milligrammes as the maximum single dose. The largest daily quantity is given as 0·025 gramme for internal and 0·02 gramme for hypodermic administration.

Physiological Action of Heroine. E. Harnack. (*Münch. med. Wochenschr.*, July 4th, 1899.) The author has brought forward some facts showing that heroine is not so harmless as was formerly supposed. He thinks that the use of heroine in practice has been premature: he has lately conducted some experiments on animals which do not agree with those published by Dreser (see *Year-Book of Pharmacy*, 1899, 228). The author insists on the futility of comparing the results obtained by experiments on animals with those obtained on the human subject, particularly in the case of narcotics. Morphine, for instance, is much more poisonous for man than the lower animals. Codeine is exactly the opposite in its action. It is impossible to judge of the true value of a narcotic merely from experiments on animals. Harnack's experiments agree with those of Dott and Stockman in ascribing to heroine a far greater depressant action on respiration than is seen in the case of morphine. Heroine is also a cardiac depressant, and in addition gives rise to muscular twitchings and convulsions. These observations are opposed to those of Dreser, who found complete muscular relaxation in his cases. Harnack considers that a maximum adult dose for the present should not

exceed 5 milligrammes, until the action of this preparation has been further investigated.

Therapeutic Efficacy of Heroine. M. Einhorn. (*Brit. Med. Journ.*, Nov. 25th, 1899; *Epit.*, No. 416.) The author concludes from his observations that this acetyl derivative of morphine (see *Year-Book of Pharmacy*, 1899, 228) is a very valuable therapeutic agent. It principally allays coughs and eases respiration, but it has also general analgesic properties, which render it of benefit in most painful affections. Except slight dizziness and occasionally dryness in the throat, which he noted but rarely, he has never seen any unpleasant symptoms even from a prolonged use of heroine.

Peronine as a Local Anæsthetic for the Eye. (*Brit. Med. Journ.*, Oct. 28th, 1899; *Epit.*, No. 340.) Peronine, the hydrochloride of the benzyl-ether of morphine, has been previously referred to as a remedy for the relief of cough (see *Year-Book of Pharmacy*, 1899, 201).

Quaita has now tried it in a large number of cases as an ophthalmic anæsthetic, and sums up his experience as follows:— Its application causes at first a severe burning sensation, which, however, soon passes off, and is followed in three or four minutes by well-marked anæsthesia, lasting for nine or ten minutes. Peronine has no action on the diameter or mobility of the pupil, nor on the accommodation, visual acuity, or eye tension. The corneal epithelium was never affected nor infiltrated, as may happen after cocaine. The great disadvantage of peronine as an ophthalmic anæsthetic is that it causes rather intense vascular injection with lachrymatous and serous chemosis. The author suggests that it may be more useful than cocaine in enucleation or evisceration of the globe, as it produces a deeper anæsthesia, and the increased vascularity does not matter in this case.

Dose of Scopolamine (Hyoscine). M. Windscheid. (*Journ de Pharm. d'Anvers*, lvi. 17.) In the author's opinion the initial dose of this base should not be more than 0·0001 gramme, and may be gradually increased to 0·0004 gramme. In these doses it proves very successful for checking the night sweats of phthisical patients. Hitherto this alkaloid has often been given in rather excessive doses.

Potassium Permanganate as an Antidote to Strychnine. M. Paratore. (*Chem. Zeit. Rep.*, 1899, 317.) The author has tested the efficacy of this antidote. His results support the conclusion that permanganate is an efficient antidote in cases of strychnine poisoning, provided it can be administered before or

immediately after the onset of the tetanic symptoms. He recommends the free use of a solution of 0·5 gramme of the permanganate in 1 litre of water. The stomach should also be well washed out with a solution containing 1 part of the salt in 5,000.

Alcohol as an Antidote to Carbolic Acid. A. M. Phelps. (*Therap. Gaz.*, xxii., 255); also J. A. Kelly. (*Bull. Pharm.*, xiii. 517.) Phelps states that the caustic action of carbolic acid on the skin may be prevented or much lessened by the immediate and copious application of alcohol to the affected parts.

Kelly reports a case of accidental poisoning by carbolic acid in which the repeated administration of small doses of alcohol (whiskey) at frequent intervals proved to be of great service.

The value of alcohol as an external antidote to carbolic acid is corroborated by Adams (*Brit. Med. Journ.*, December 30th, 1899; *Epit.*, No. 511).

Alcohol as an Antidote to Carbolic Acid. E. V. Howell. (*Amer. Journ. Pharm.*, 1900, 302.) The experiments carried out by the author tend to show that the effect of alcohol in counteracting the effects of carbolic acid is probably one of dilution.

In order to lessen the dangers connected with the use of carbolic acid by the public, C. S. N. Hallberg recommends that a 25 per cent. alcoholic solution of this acid should be sold for household purposes.

Liquor Ammonii Acetatis as an Antidote to Formaldehyde. G. André. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 550.) The author has successfully employed solution of ammonium acetate as an antidote in a case of poisoning by formaldehyde. He explains its action by representing the chemical reaction between the two substances as resulting in the formation of hexamethylene-amine acetate and free acetic acid.

Chloral Hydrate as an Antidote to Cocaine. M. Gioffredi. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 236.) The results obtained in clinical trials induce the author to recommend the use of large doses of chloral hydrate—3 to 4 grammes—as an antidote in cocaine poisoning. Paraldehyde and sulphonal are found to have a similar action. The converse does not hold true, however for cocaine is not an antidote to poisoning by chloral hydrate.

Chloral Hydrate in Nervous Dyspepsia. O. Rosenbach. (*Therap. Monatsh.*, 1899, ix.) The author directs attention to the value of very small doses of chloral hydrate in the gastric disturbance of neurotic subjects. He has obtained the best results in the case of patients troubled with sensations of distension referred

to the epigastrium, of oppression referred to the chest, of colic-like pain apparently due to spasm at the pylorus ; also those suffering from nervous flatulence and from diarrhœa due to excessive peristalsis. The dose is from 1½ to 3 grains, dissolved in a wineglassful of water, three times a day one or two hours after a meal. The author has likewise found it useful for the nervous palpitation and irregularity of cardiac action common in dyspeptics, and also for the slighter forms of nervous depression.

The Administration of Trional. S. Pouchet. (*Bull. gén. de Thérap.*, Dec. 8, 1899, and *Journ. de Pharm. d'Anvers*, lvi. 16.) The author refers to the inconvenience arising from the sparing solubility of trional in hypnotic doses, and suggests that the usual plan of giving it in cachets is responsible for the inconstancy of the results obtained with it. He states that it is soluble in oil of sweet almonds in the proportion of 1 in 20 at ordinary temperatures (20° to 25° C.) From this an emulsion can be prepared, and the dose, and consequently its hypnotic effects, easily regulated. He suggests that it may be given in the following combination: Trional 1 part, oil of sweet almonds 20 parts, sugar 8 parts, gum arabic ⅕th part, tragacanth ⅕th part, orange flower water 10 parts, and cherry laurel water 2 parts. The emulsion is to be given in water or milk. Another formula suggested is as follows: Trional ½ to 1 part, oil of almonds 10 to 20 parts, the yolk of 1 egg and water 150 parts.

Physiological Action of Formaldehyde. G. Bruni. (*Chem. Centr.*, 1900, 51–52.) When administered internally, even in dilute solutions, formaldehyde causes vomiting. With non-poisonous doses, hardening of the tissues takes place in a few days. Perfectly neutral formaldehyde is borne better than the acid commercial preparation. The acid solution is much more fatal to micro-organisms than the neutral. The antiseptic properties of formaldehyde greatly exceed those of boric acid.

Injurious Effects of Boric Acid and Formaldehyde. H. E. Annett. (*Lancet*, 1899, 1282.) The author has experimented with kittens in order to investigate the effect of feeding with milk containing boric acid and formaldehyde as preserving agents. The boric acid was used in the proportion of 80 grains per gallon of milk, while in the experiments with formaldehyde proportions ranging from 1 in 50,000 to 1 in 12,500 were tried. In all cases injurious effects were produced, the symptoms being diarrhœa, inactivity and depression, and finally emaciation and death. For fuller details the original paper should be referred to.

Toxic Effects of Boric Acid. J. J. Evans. (*Pharm. Journ.*, 4th series, ix. 54, from *Brit. Med. Journ.*) In treating a case of cystitis with gradually increasing doses of 10 to 20 grains of boric acid, 3 times a day for about three to four weeks, an erythematous rash was observed to spread over the patient's neck, face, and head, followed by some subcutaneous œdema, and a fine scaly dermatitis. The salivary glands became enlarged, and eventually the hair on the face and head fell out. The drug was discontinued, but six weeks elapsed before there was any reappearance of hair on the face or head. In numerous other cases of cystitis and urethritis, extending over a period of five years, the author has observed similar effects following the administration of boric acid, viz., an erythema followed by a fine scaly exfoliation. Immediate discontinuance of the drug prevented development of the more severe symptoms, but in one case in which it was inadvertently continued the hair fell out to a slight extent, and there was marked exfoliation of the skin, especially of the hands, with onychia and splitting of the nails. The author concludes that the symptoms were entirely due to the action of boric acid on the skin and appendages.

Harmlessness of Borax and of Boric Acid as Preservatives. O. Liebreich. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 204.) The author states that as much as 1 gramme of borax may be taken daily without any toxic effect, and that, therefore, there is no sanitary objection to its use. Care must be taken, however, to avoid the foisting upon the public of inferior qualities of food through the utilisation of the preservative qualities of the borax. Boric acid also is found by the author to be a harmless preservative, proving innocuous even after prolonged use.

Guaiacol Cacodylate in Phthisis. (*Bull. Comm.*, xxviii. 35.) Barbary has obtained good results in tubercular diseases with subcutaneous injections of guaiacol cacodylate, in doses of 3 to 5 centigrammes.

Administration of Arsenic in the form of Sodium Cacodylate. J. Rénaut. (*L'Union Pharm.*, xl. 252.) The author expresses himself strongly in favour of sodium cacodylate as a means of administering arsenic, especially in the case of phthisical patients. He particularly recommends rectal injections of 5 c.c., of a solution of 25 centigrammes in 200 grammes of water, which do not produce the slightest irritant action on the mucous membrane of the bowel. He also employs hypodermic injections in doses of $\frac{1}{2}$ to 1 grain of the salt in 24 hours, continued for a week at a time, with one week's interval between each course and the next.

Pharmacy of Sodium Cacodylate. (*Bull. gén. de Thérap.*, cxxviii. 220. From *Pharm. Journ.*) Danlos prescribes sodium cacodylate in the following *mixture*: Sodium cacodylate, 2 grammes; rum, simple syrup, of each, 20 grammes; distilled water, 60 grammes; oil of peppermint, 2 drops. A teaspoonful contains 10 centigrammes of the salt. *Pills* may be made containing 10 centigrammes, massed with extract of gentian. *Rectal injections* are employed by J. Rénaut in two strengths, the weaker containing 25 centigrammes of the salt, the stronger 40 centigrammes in 200 c.c. of water. 5 c.c. is used for a rectal injection twice daily for six days, three times a day for ten days, then allowing a lapse of thirty days before recommencing the treatment. *Hypodermic injection* of sodium cacodylate is obtained by A. Gautier by neutralising cacodylic acid, 5 grammes, with sodium carbonate; then adding cocaine hydrochloride, 8 centigrammes; creosote, 6 drops, dissolved in alcohol, 8 grammes; sterilised water to produce, 100 c.c. Each c.c. contains 5 centigrammes of cacodylic acid. Danlos employs the following formula: Morphine hydrochloride, 25 milligrammes; cocaine hydrochloride, 10 centigrammes; sodium chloride, 20 centigrammes; sodium cacodylate, 5 grammes; phenol solution (5 per cent.), 2 drops; distilled water, to 100 c.c. A medium dose of the salt by hypodermic injection is 2 to 5 centigrammes. The maximum of 10 centigrammes in 24 hours should not be exceeded.

Arsenic as a Preventative against Thyroidism. M. L. Mabille. (*Brit. Med. Journ.*, Oct. 28, 1899; *Epit.*, No. 341, from *Nouv. Rem.*) The author has made a number of clinical observations which seem to demonstrate the value of arsenic for the above purpose. He recounts the use of arsenic to counteract the tachycardia following overdoses of the preparations of thyroid gland. Oxygenation of the blood and oxidation of tissues, which are so greatly increased by the administration of thyroid extract, or of iodothyrin, are considerably diminished by arsenic. Animals treated with iodothyrin, with consequent acceleration of pulse, show a decided diminution of the pulse-rate after administration of arsenic in the form of Fowler's solution. In animals not so treated with the arsenic there were present tachycardia, trembling and general bodily excitement, anorexia and loss of bodily weight, all of which could be counteracted by arsenic.

Therapeutic Properties of Oxybromate and Sulphocarbolate of Bismuth. H. Woods. (*Nouv. Rem.*, xv. 394.) The author employs bismuth oxybromate in the treatment of nervous disorders of the stomach. It can be given several times a day in doses of

60 centigrammes, but in smaller doses of 30 to 40 centigrammes it is very efficacious. Being an insoluble yellow powder, it should be suspended by means of mucilage of acacia. Bismuth sulphocarbolate, a rose-coloured powder, slightly soluble in water, is employed by the same author in certain febrile maladies, in dyspepsia, and in abnormal fermentations in the alimentary canal; it forms a useful antiseptic. It is given in the form of a cachet in doses of 20 to 50 centigrammes three or four times daily.

Silver Salts in Acute Pneumonia. (*Brit. Med. Journ.*, Feb. 10, 1900; *Epit.*, No. 117.) Caccianiga reports on sixty cases of acute lobar pneumonia in which treatment by silver nitrate was clearly beneficial—only three of the cases were fatal. The dose given was 0·10 gramme for children from eight to ten years, up to 0·25 to 0·30 gramme for adults, in pills or suspension. In urgent cases an injection of a 0·5 per cent. solution of protargol was injected hypodermically. Beyond some vomiting, no ill effects were observed.

Administration of Colloidal Silver. (*Deutsch. Amer. Apoth. Zeit.*, xx. 109, and *Nouv. Rem.*, xv. 472.) A. Schlossman has investigated the therapeutic value of colloidal silver and finds it to be an excellent internal and external antiseptic. In septicæmia it may be given in the form of pills composed of colloidal silver, 50 centigrammes; milk sugar, 5 grammes; glycerin and water, of each sufficient to make a mass. Divide into fifty pills. Two to be taken for a dose, twice or three times a day before meals. In mixture form it may be dispensed as follows: Colloidal silver, $\frac{1}{2}$ to 2 grammes; distilled water, 50 to 200 grammes; fresh white of egg and glycerin, of each 0·5 to 2 grammes. A teaspoonful to be taken in a glass of water three times daily, from 15 to 30 minutes before meals. Pills, each containing 5 centigrammes of colloidal silver and 25 milligrammes of milk sugar, are employed in surgical practice for introduction into the cavities of fistulas, and into deep lesions of various organs. In endometritis, Klein has employed it in the form of rods, containing 20 centigrammes of colloidal silver, massed with milk sugar, gum arabic, and glycerin.

Mercurial Ointment in Erysipelas. M. Dematteis. (*Brit. Med. Journ.*, December 23, 1899; *Epit.*, No. 487.) The author publishes a short summary of eight cases of erysipelas treated by mercurial ointment either alone or diluted with vaselin. The results were so successful that the author urges a larger trial of this mode of treatment. He found it of value not only in the more or less stationary cases, but in those where the disease had a tendency to spread in other parts; even in gangrenous erysipelas

it controls the extension of the disease. Probably these results are due to the bactericidal action of the mercury.

Relative Merits of Potassium Iodide and Iodalbacide in the Treatment of Syphilis. F. Blum. (*Brit. Med. Journ.*, September 2, 1899; *Epit.*, No 183.) The relation between potassium iodide and iodalbacide appears to be similar to that between pure glucose and starch; the latter never produces alimentary glycosuria, as it is only absorbed in proportion to its conversion into dextrose, no matter how great the dose. In the same way iodalbacide never produces so acute an excess of iodine, liberated in the tissues of the body, as potassium iodide. Iodalbacide is also practically not eliminated by the kidney, and hence during its sojourn in the body not only is its action (in liberating iodine in the tissues) slower and steadier, but its excretion from the system is slower. Hence its action is also more protracted. In numerous cases of syphilis and psoriasis in which potassium iodide produced slight or grave symptoms of iodine poisoning, the administration of iodalbacide was found to be quite free from such effects. The largest part of doses of potassium iodide administered in tertiary syphilis passed through the body too readily to affect the morbid tissues, for example, gunmata. In all these respects iodalbacide proved superior in its persistence. According to this view potassium iodide is indicated in cases in which the first rapid action of iodine is desired, for example, in florid tertiary eruptions; but in all cases in which a protracted iodine treatment is desired, and where at the same time it was necessary that the total amount of iodine administered should be absorbed and iodism, that is, free and extensive liberation of iodine in the tissues, avoided, iodalbacide should be prescribed. Fifty cases of syphilis were treated on these principles with iodalbacide, half of these being at the Dermatological Hospital and Poliklinik at Breslau, and the other half from the private practice of Professor Neisser in every case good results were noted. Where there was any disposition to iodism, iodalbacide alone could be used. When the dangerous and destructive symptoms of the tertiary stage had disappeared, it was essential that the treatment should be kept up, and for this purpose iodalbacide met all requirements. Three to five grains of the substance in capsules were administered daily for this purpose.

Iodide of Potassium in the Treatment of Acne. F. J. Leviseur. (*New York Med. Rec.*, November 11, 1899. From *Brit. Med. Journ.*) The author claims successful results for this treat-

ment when applied to old-standing cases of acne which are not cured by ordinary methods. Iodic acne is a superficial dermatitis together with formation of minute abscesses in the cutis, the result of the disorganisation of small blood vessels at special points, through the iodine circulating in the blood. Hence potassium iodide is given to cause a reaction in and around the acne lesions, resembling that occurring in lupus nodules after the injection of tuberculin. Five-grain doses are given three times a day. Milk is the best vehicle, as the alkali and albuminates of the milk neutralise a considerable quantity of the iodine. When the acne tumours show redness and swelling, and are painful on pressure, the iodide is stopped and mild sulphur and ichthyol unguents used. After seven days it is again administered, and upon the appearance of reactionary signs it is again changed and the usual local treatments adopted.

Potassium Permanganate in Psoriasis. (*Brit. Med. Journ.*, September 16, 1899; *Epit.*, No. 225.) Rasch has used a 2 per cent. solution of potassium permanganate in fourteen cases of psoriasis. In some cases the disease disappeared in two or three weeks; in other cases little or no effect was produced. The drug was painted on the spots twice a day.

Potassium Permanganate in Dysentery. M. Gastinel. (*Med. Press*, lxviii. 350.) The author finds that rectal injections of solution of potassium permanganate give excellent results in the treatment of dysentery. A 0·5 per mille solution is employed, made warm by mixing ten ounces of a 1 : 1000 solution with an equal volume of hot water so that the temperature of the mixture is brought to 112° F. The first enema is applied in the evening, a second one is given next morning, followed in a few hours by a dose of calomel. The enemata are then repeated every 24 hours, and as the symptoms indicate are gradually diminished, both in frequency and in strength.

Magnesium Sulphate in Acute Tropical Dysentery. F. A. Rouget. (*Brit. Med. Journ.*, November 18, 1899, 1413.) The author confirms Wyatt-Smith's observations as to the value of magnesium sulphate in acute tropical dysentery. The salt was administered in doses of 1½ to 2 drachms, with 10 minims of aromatic sulphuric acid and some cinnamon water and syrup. The result of the treatment was in all cases without exception remarkable. In from eighteen to thirty-six hours the dysenteric stools entirely disappeared; soft yellowish fæces were passed instead, and in a few days the cure was complete. During

convalescence a powder composed of 15 grains of salicylate of bismuth and 10 grains of benzonaphthol was given three times a day, to which 3 or 4 grains of Dover's powder were sometimes added. The treatment with magnesium sulphate should be continued for some days after the stools have ceased to be dysenteric. Careful diet must be observed, which should consist essentially of milk.

In cases of chronic dysentery, magnesium sulphate was not found to be of much value.

Therapeutic Properties of Calcium Peroxide. M. Rochkovsky. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 323, from *Bull. gén. de Thérap.*) Calcium peroxide is found by the author to be a useful remedy for the treatment of digestive disturbances of children, especially in acid dyspepsia. It is a yellowish powder which on treatment with water is slowly decomposed with evolution of oxygen. It possesses both antacid and antiseptic properties, and is given in daily doses of 0·18 to 0·60 gramme in milk.

Salt Starvation in Epilepsy. C. Richet and M. Toulouse. (*Brit. Med. Journ.*, January 20, 1900; *Epit.*, No. 54.) The authors' experience with a number of epileptic patients seems to demonstrate that depriving the nervous system of the usual amount of salt in the food renders the nervous tissue more susceptible to the absorption of medicinal salts, which it takes up to a remarkable extent, thus rendering an extremely small dose effective. Thus 2 grammes of sodium bromide a day, administered under the conditions referred to, arrested the epileptic attacks, sometimes in less than a week, no matter how frequent they had been before. Several patients had shown no recurrence for six months since treatment. The authors propose to call this the metatrophic method, and suggest that it may possibly apply also to affections treated with quinine, digitalis, atropine, etc., as well as those in which the alkaline salts are administered. The saltless food had no bad effect on the patient.

Sodium Metavanadate as a Therapeutic Agent. (*Nouv. Rem.*, xv. 241.) This salt acts as a powerful oxidising agent, and though toxic in large doses, promises to be a useful and energetic tonic and stimulant to the nutritive organs, if administered in doses of one or two milligrammes two or three times a day before meals. The treatment is soon followed by an improvement of the appetite and an increase in strength and weight. It is recom-

mended to allow an interval of two or three days after each week of treatment.

Toxic Action of Sodium Fluoride. H. B. Baldwin. (*Journ. Amer. Chem. Soc.*,1899, 517–522.) In doses varying from 0·25 to 9 grammes, sodium fluoride produces nausea, vomiting, and salivation, also frequently diarrhœa, the effects varying in intensity with the constitution of the individual. In one case, where a man accidentally took at least 10 grammes, death ensued within 24 hours. In cases of suspected poisoning, the urine may be advantageously tested for fluorine.

Toxicology of Potassium Chlorate. S. J. Meltzer. (*Amer. Journ. Physiol.*, 1900, [3], ix.) It is found that the fatal effects of potassium chlorate are not due to changes in the blood, but to paralysis of the inspiratory muscles. Death often supervenes before the blood is altered, and the formation of methæmoglobin within the vessels is comparatively harmless. Intracerebral injection shows this salt to be a poison to nerve-cells, first exciting, then paralysing them.

Hydrogen Peroxide in Whooping-Cough. (*Pediat.*, ix. 432. From *Pharm. Journ.*) Baroux finds the treatment of pertussis by the vapour of hydrogen peroxide to give very good results. The peroxide used is of the strength of 12 volumes, 80 grammes of which are poured upon a clean white linen cloth, 1 metre square, every four hours, the wet cloth being suspended from a line in the middle of a small room in which the patient is confined. It is preferable to have two such chambers, one occupied by day, the other by night.

Desiccated Suprarenal Capsule in Acute Coryza. M. Millener. (*Brit. Med. Journ.*, April 21, 1900; *Epit.*, No. 311.) The author refers to the effect of suprarenal extract in producing anæmia of mucous surfaces. In consequence of this it may be applied in the form of an aqueous solution (20 grains of dried extract in half an ounce of water filtered through cotton) to the congested nasal mucous membrane in coryza. The nose and naso-pharynx should first be cleansed with an alkaline wash of sodium salicylate, sodium bicarbonate, and boracic acid. The solution is applied on pledgets of cotton.

Suprarenal Extract in Epilepsy. C. Hill. (*Brit. Med. Journ.*, Jan. 6, 1900; *Epit.*, No. 14.) A glycerin extract of the fresh gland was prepared and found to be superior in the constancy of its effects to the dried extract. It was made by macerating 1 oz. of the powdered gland for 48 hours with 200 c.c. of glycerin, 300

c.c. of water, and 20 grains of mercuric iodide, then filtering, and making a further addition of water so that each fluid drachm of the solution represents 1 grain of gland. This extract was administered in the following combination:—Glycerin extract of suprarenal, ʒi; calcium chloride, gr. ii; sodium bromide, gr. v; *t. d. s.* The author claims to have been very successful with this treatment.

Suprarenal Extracts. B. Moore and C. Purinton. (*Amer. Journ. Physiol.*, 1900, [3], xv.) In the dog, injection of extracts of suprarenal medulla in doses, varying from 0·24 to 24 millionths of a gramme per kilo. of body weight, produces marked results. The minutest doses produce a fall instead of a rise of blood pressure. This is considered to be due to the action of the same active substance, not to admixture with a second material. The results show that any activity possessed by the substances hitherto isolated from the suprarenal medulla may be explained by slight contamination with the unaltered active principle. In separating the active substance, the use of alkali should be avoided. The presence of the chromogen must not be taken alone to indicate the presence of active material. A new colour reaction of the chromogen is described, namely, dilute ferric chloride after excess of zinc acetate gives an evanescent, deep violet colour, which, in strong solutions, leaves a violet precipitate.

Physiological Action of Extracts of Sympathetic Ganglia. A. Cleghorn. (*Amer. Journ. Physiol.*, 1899, 471–482.) From considerations as to the similarity of structure between sympathetic ganglia and suprarenal medulla, the effect of injecting glycerin and aqueous extracts of the ganglia into the circulation of animals was investigated. These extracts produce a fall of blood pressure which can be counteracted by suprarenal extract. The lowering of blood pressure is produced by the action of the extract on the neuro-muscular mechanism of the blood-vessels; the tonus of the heart muscle is lowered, the latent period and relaxation period of skeletal muscle are lengthened; there is no action on the pupil. Extracts of brain, cord, spinal ganglia, and nerves produce no fall of blood pressure.

Clove Extract in Affections of the Cornea. (*Merck's Report*, 1900, 71.) Krawtschenko directs attention to the value of a thin aqueous extract of cloves in the treatment of corneal opacity. It is applied either by instillation or with a camel-hair pencil. As it gives rise to a considerable amount of irritation, it should not be employed when acute inflammation is present. Repeated in-

stillations at intervals of five to ten minutes are made twice daily; the pain produced by the instillation is of such short duration that the use of an anæsthetic, such as cocaine, does not appear to be necessary.

Tincture of Strophanthus as a Prophylactic administered before Chloroform Narcosis. M. Feilchenfeld. (*Pharm. Zeitung*, 1900, 241, from *Deutsch. Med. Zeitung.*) The author recommends the administration of 5 to 6 drops of tincture of strophanthus for the two last evenings preceding the day of the operation, in order to increase the resisting power of the heart.

Tincture of Fat-Free Digitalis. J. W. England. (*Amer. Journ. Pharm.*, 1899, 332–344.) The author advocates the preparation of tincture of digitalis from leaves previously freed from fat by treatment with purified petroleum ether. He finds the product thus obtained to be more prompt in its assimilation and action than the ordinary tincture.

A Dialysed Preparation of Digitalis. M. Bosse. (*Centralbl. für inn. Med.*, July 8, 1899; *Brit. Med. Journ.*, Feb. 3, 1900; *Epit.*, No. 95.) The author has obtained good results with a preparation of digitalis prepared by dialysis. The process is conducted with freshly gathered plants, and in such a manner that 1 part by weight of the dialysate corresponds exactly to 1 part of the fresh leaves. One advantage of this preparation is that all strong reagents are avoided during the process of the extraction of the active constituents. The product is given in single doses of 6–10 drops for an adult; the maximum daily quantity should never exceed 80–100 drops. The author found that it relieved all cardiac symptoms quickly, and that its diuretic effect was particularly marked and persistent.

Tincture of Myrrh. G. F. Merson. (*Pharm. Journ.*, 4th series, x. 44–45.) This tincture is required in the present Pharmacopœia to be made by maceration only, while in the 1885 edition it was directed to be made by maceration and percolation. The author considers this as a retrograde step, as he finds that percolation gives distinctly the better tincture; it ensures a more complete extraction of the resin, involves a smaller loss of menstruum, and is much more expeditious. The author also refers to a number of commercial samples of the tincture which he has examined, and finds these to vary much in specific gravity and colour. He considers, however, that specific gravity, which should not fall below 0·851, is not of very much importance, as the percentage of moisture present in the crude drug, which is variable, will affect it to a greater

or less extent, and it would be very easy to adjust a tincture to any given figure. As regards colour, it is well known that inferior grades of myrrh yield high-coloured tinctures.

Ethereal Extract of Male Fern. R. Boehm. (*Thérap. Gazz.*, xxiii. 179.) The author finds that the anthelmintic value of this extract depends on the presence of aspidin as well as of filicic acid. Out of eleven preparations examined, six contained from 2 to 3 per cent. of aspidin, while filicic acid was absent, four contained filicic acid and no aspidin, and one small quantities of both. The author concludes that an oleo-resin rich in aspidin is preferable to one containing filicic acid.

Ethereal Extract of Male Fern. A. Hausmann. (*Archiv. der Pharm.*, ccxxxvii. 544–560.) Aspidin is found not to occur in the roots of *Aspidium filix mas*, but to be always present in *Aspidium spinulosum*; hence the conclusion is drawn that an extract containing this principle is made wholly or partly from the roots of the last-named plant. Filicic acid is present in extracts from both *A. filix mas* and *A. filix femina*. Flavaspidic acid occurs in the extracts from all the ferns named. Albaspidin and aspidinol occur in extracts containing filicic acid, as well as in those which contain aspidin. Poulsson's polystichin and polystichalbin (see *Year-Book of Pharmacy*, 1899, 129) are regarded by the author as possibly identical with aspidin and albaspidin, and either his polystichocitrin or polystichoflavin with flavaspidic acid, though the analytical results do not agree.

Extractum Belladonnæ, B.P. F. A. Upsher Smith. (*Pharm. Journ.*, 4th series, ix. 359.) The author discusses the green and the alcoholic extracts of belladonna, their relative merits and claims to preference, and the misconceptions liable to arise from the existence of two distinct extracts. He considers that in support of the green extract it may be urged:—(1) That the older practitioners have it in view when writing prescriptions; (2) that in the list of alterations in the nomenclature of the preparations of the B.P., 1898, extractum belladonnæ viride is given as the new name for extractum belladonnæ; and (3) that the green extract possesses better binding properties than the alcoholic when used for forming pills. On the other hand, it may be claimed for the alcoholic extract:—(1) That it is a preparation of definite strength; (2) that it is free from chlorophyll, consequently there is less difficulty in making belladonna suppositories with it; and (3) that the suppositoria belladonnæ of the B.P. are made with the alcoholic extract.

Acetic Extract of Belladonna. E. R. Squibb. (*Amer. Journ. Pharm.*, 1900, 1–9.) The author has further extended his experiments respecting the value of acetic acid as a substitute for alcohol in extracting the active principles of some officinal drugs. The acid should not be weaker than 10 per cent. to ensure thorough extraction, and with an acid of this strength good results are obtained in most cases. In the case of belladonna root, the acetic and U.S.P. alcoholic extracts appear to be of equal value, the total alkaloid present being 0·688 and 0·683 per cent. respectively. The acid preparation, however, is of much lighter colour, yields no deposit on standing for three months, and does not precipitate on being added to water, whereas the alcoholic preparation is very dark, yields within three months a slight precipitate containing traces of alkaloids, and precipitates on being added to water.

Acetic Extract of Cinchona. E. R. Squibb. (*Amer. Journ. Pharm.*, 1899, 305–312.) The author reports that acetic acid of 10 per cent. strength is a good menstruum for the exhaustion of cinchona bark. The alcohol and glycerin menstruum of the U.S.P. seems to exhaust the bark more rapidly, but it yields percolates loaded with useless and objectionable organic matters, from which the acetic acid percolates are comparatively free. The stronger percolates from the alcohol and glycerin menstruum were almost syrupy in consistence, so black as to be almost opaque, and very astringent, whilst they threw down an unmanageable precipitate of nearly insoluble cincho-tannates on dilution or admixture with other preparations or any ordinary diluents. The corresponding acetic acid percolates were nearly free from those disadvantages, and far more manageable pharmaceutically as well as therapeutically. The acid menstruum, moreover, has the advantage of cheapness besides that of being less troublesome in the percolation and the standardising process; the percolates yielded by it are not injured by evaporation. The proportion of free acid contained in an acetic extract of cinchona was found to be from 10 to 11 per cent., the least quantity being present when there had been most evaporation. 10 per cent. of acid are stated to suffice fully for securing the stability and permanency of the fluid extract under all ordinary conditions. When the extract is mixed with three or four times its volume of water, the mixture has the appearance of coffee with milk; in that condition the taste of free acid is very slight and not disagreeable. The author's final conclusion is that the acid fluid extract is in every respect a better preparation than an alcoholic one.

Assay of Liquid Extract of Cinchona. J. Stenhouse. (*Pharm. Journ.*, 4th series, x. 10.) The official assay process is troublesome, as the shaking of the alkaline liquid extract with benzolated amylic alcohol causes emulsification, which cannot readily be overcome without loss of time and of alkaloid. The following is recommended by the author as an expeditious and less troublesome process:—Introduce into a separator 5 c.c. of the liquid extract or 10 c.c. of the tincture, mixed with 10 c.c. of water, add excess of ammonia, and shake the alkaloid out with three successive portions of ether-chloroform (9 of ether to 1 of chloroform). Dissolve out the alkaloids from their ether-chloroform solution by agitating in the separator with 20 c.c. of dilute sulphuric acid (5 per cent.), and twice more with 10 c.c. of acidulated water. The aqueous solution of acid sulphates of the alkaloids is then rendered ammoniacal, and the alkaloid removed by agitation with 3×10 c.c. of chloroform. The mixed chloroformic solutions are evaporated in a tared dish and the residue of alkaloid dried to constant weight at 110° C.

Extractum Cascaræ Sagradæ Liquidum. J. C. Umney. (*Pharm. Journ.*, 4th series, x. 8.) In order to keep this preparation, under all conditions of storage, the author considers it necessary to add to it 25 per cent. more alcohol.

Fluid Extract of Convallaria Majalis. M. Morguliss. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 369. From *Pharm. Journ.*) The author takes exception to the preparation of this extract from the root, as recommended in the U.S.P., since that portion of the plant contains but very little glucoside. He advocates the following method:—100 parts of freshly gathered flowers, quickly dried between 30–35° C. and finely powdered, are moistened with 35 parts of 95 per cent. alcohol and 5 parts of water and allowed to stand for a time. The moistened mass is now allowed to macerate in a percolator with another 40 parts of the same menstruum for two days. Then 85 parts are allowed to percolate through and set aside, using more menstruum, if necessary. The drug is then exhausted by further percolation with 500 parts of alcohol of 95 per cent. This last alcoholic percolate is mixed with 5 parts of glycerin and the alcohol allowed to evaporate. The residue is evaporated, at a temperature of not over 50° C., to 10 parts, mixed with the reserve, and made up to 100 parts with alcohol of 70 per cent. Wobbe, on the other hand, recommends in preference the following method: 100 parts of dried flowers are moistened with a mixture of glycerin, 10 parts, water, 15 parts, alcohol (90 per cent.), 25 parts, and then exhausted in a percolator

with a mixture of equal parts of alcohol and water. The first 80 parts are reserved, the remainder is evaporated to a thin extract; this is dissolved in 40 parts of water, filtered and evaporated to 20 parts; this, mixed with the 80 parts of reserve, gives 100 parts.

Assay of Commercial Extract of Liquorice. B. Hafner. (*Zeitschr. des oesterr. Apoth. Ver.*, xxxvii. 542. From *Journ. Chem. Soc.*) Ten grammes of the coarsely powdered extract are warmed for several hours with 200 c.c. of 95 per cent. alcohol and 25 c.c. of *N* sulphuric acid, and the insoluble matter is washed with alcohol. The filtrate, made feebly alkaline with ammonia, and diluted with an equal volume of water, is evaporated, made up to 100 c.c. with water and a few drops of ammonia, filtered, and precipitated with dilute sulphuric acid. The precipitated glycyrrhizin is washed with 2–3 per cent. sulphuric acid, dried in the desiccator, and then extracted with acetone on the water-bath. After adding water and barium carbonate, the acetone is expelled on the water-bath, the residue digested with 200 c.c. of hot water, and the filtered solution evaporated, dried at 100°, and weighed. The barium glycyrrhizate thus obtained should contain 18·76 per cent. of barium, which may be confirmed by evaporating with sulphuric acid, and igniting.

Commercial Extract of Liquorice. E. Dowzard. (*Chemist and Druggist*, lv. 561.) The tables on p. 195 give the figures obtained in the examination of a number of samples of Spanish juice and block-juice. All were well-known brands.

In Spanish juice (stick) the constituents vary as follows:—Extractive, 59 to 83 per cent.; insoluble, 6 to 28 per cent.; water, 10 to 16 per cent.; and ash, 3·5 to 10 per cent. In block-juice the variation of constituents is:—Extractive, 70 to 82 per cent.; insoluble, 1 to 11 per cent.; water, 14 to 28 per cent.; and ash, 6 to 9 per cent.

Assay of Extractum Ipecacuanhæ Liquidum. F. H. Alcock. (*Pharm. Journ.*, 4th series, ix. 494.) The author recommends the following method as more accurate, more expeditious, and less troublesome than the official process. It is based upon the two following experiments:—

Experiment I.—If five cubic centimetres of liquid extract of ipecacuanha be mixed with ten cubic centimetres of ether and vigorously shaken, a slimy precipitate of a dark reddish brown colour is formed which adheres to the sides of the vessel, and the liquid portion becomes nearly clear and has a slight yellow colour.

Experiment II.—If five cubic centimetres of liquid extract of

Spanish Juice (Stick).

—	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
Extractive matter	59·80	61·60	64·04	65·00	66·13	67·10	67·61	70·10	71·30	73·30	73·40	74·40	77·35	78·30	81·70	82·75
Insoluble matter	27·00	27·40	23·00	23·00	22·00	18·60	19·83	14·20	16·00	11·30	16·60	12·00	13·00	9·60	6·00	7·00
Water	13·20	11·00	12·96	12·00	11·87	14·30	12·56	15·70	12·70	15·40	10·00	13·60	9·65	12·10	12·30	10·25
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Ash	4·60	4·80	6·30	6·50	7·20	9·60	7·50	7·20	3·60	7·70	8·90	7·00	3·80	6·50	8·00	8·40

Block-Juice.

—	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Extractive matter . .	70·80	72·43	74·17	75·40	77·44	79·60	80·70	80·44	81·60	81·67
Insoluble matter . . .	1·80	1·50	7·30	10·20	1·30	4·00	2·30	1·33	2·60	4·03
Water	27·40	26·07	18·53	14·40	21·26	16·40	17·00	18·23	15·80	14·30
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Ash	7·00	7·16	6·00	7·85	6·70	7·93	8·40	6·10	7·60	6·50

ipecacuanha be mixed with five cubic centimetres of B.P. dilute sulphuric acid and ten cubic centimetres of ether, and well shaken and then allowed to rest, the liquid separates into two clear layers —an upper ethereal layer of a yellow colour, a lower layer of a deep reddish-brown colour.

Proceed as in the second experiment, which may be conducted in a well-corked bottle, remove the ethereal layer by a teat and pipette, and wash the lower layer with five cubic centimetres of ether, mix these solutions and wash them twice with small quantities of water and add these washings to the alkaloidal solutions if thought desirable.

The ethereal solution on evaporation shows the amount of fatty matters, and does not contain any alkaloid.

To the alkaloidal solution contained in a separator add seven and a half cubic centimetres of ether-chloroform (one volume of the former and two or more volumes of the latter), render alkaline with ammonium hydrate, shake well, warm to 120° F., separate the lower layer, wash a second time with the alkaloidal solvent in suitable quantity, remove and repeat the washing if necessary, and evaporate the alkaloidal solution in a tared dish in the usual way. A flocculent precipitate of a brown colour appears after the addition of the alkali and alkaloidal solvent, which sometimes interferes with the separation, but this can be overcome by aspirating the whole liquid through cotton wool, and washing the latter with a few cubic centimetres of ether-chloroform afterwards.

The B.P. Preparations of Ipecacuanha. R. G. Guyer. (*Pharm. Journ.*, 4th series, ix. 622.) The author calls attention to the deterioration in strength of liquid extract of ipecacuanha and of ipecacuanha wine on keeping. A sample of the liquid extract containing, when first standardised, 2·08 per cent. of total alkaloids, was found to contain only 1·528 per cent. after two months. The deterioration of ipecacuanha wine was found to be still more considerable and rapid. Further experiments made by the author in order to check these results gave similar indications. Fuller particulars will be found in the original paper.

Confirmatory evidence respecting the deterioration in the alkaloidal value of these two ipecacuanha preparations is furnished by J. C. Umney (*Pharm. Journ.*, 4th series, x. 8).

Methyl Alcohol as a Menstruum. W. L. Scoville. (*American Druggist*, xxxv. 131–132.) The author's experiments tend to show that thoroughly purified methyl alcohol forms a suitable and as unobjectionable a menstruum for the preparation of many

tinctures and alcoholic extracts as ethyl alcohol. There seem to be but slight differences in the action of the two alcohols upon the drugs tried, and the finished products also exhibit very little difference. The author, however, does not countenance the use of methyl alcohol in the place of ethyl alcohol in the making of such preparations, at least not until its suitability is generally recognised by medical and pharmaceutical authorities and its use openly sanctioned.

Preparation and Testing of "Spiritus Cochleariæ." J. Gadamer. (*Journ. Chem. Soc.*, from *Archiv der Pharm.*, ccxxxix. 105–110.) The method of preparation prescribed by the German Pharmacopœia, namely, to distil the green, crushed scurvy-grass with alcohol and water, is unsuitable. In the first place, the immediate addition of alcohol prevents the due action of the ferment, by means of which the thiocarbimide is probably formed from some glucoside, and, in the second place, the green plant is available only during a very limited season of the year; nor can the artificial oil of scurvy-grass be employed, for it is isobutylthiocarbimide, whereas the natural oil is secondary butylthiocarbimide. A normally prepared spirit contains 0·06–0·07 per cent. of secondary butylthiocarbimide, and may be prepared suitably from the dry plant in the following manner:—Dried scurvy-grass (4 parts) and coarsely powdered white mustard (1 part) are allowed to remain with water (40 parts) for 3 hours in a glass retort; spirit of wine (15 parts) is then added, and 20 parts are distilled over. (The dried scurvy-grass does not contain the ferment present in the green plant; the mustard is intended as a substitute for it.) The distillate is a clear, colourless, feebly dextrorotatory liquid with a peculiar odour and penetrating, burning taste; it has a sp. gr. of 0·908–0·918.

The purity of the spirit may be tested by heating 50 grammes with 5 c.c. of ammonia for a few hours on the water-bath in a flask furnished with an air condenser, evaporating to dryness, extracting the residue with a little alcohol, and allowing the filtered alcoholic extract to evaporate on a watch glass; the melting point of the crystals should lie between 125° and 135°.

The strength of a pure spirit is ascertained by allowing 50 grammes to remain with 10 c.c. $N/10$ silver nitrate solution and 5 c.c. of ammonia solution for 24 hours in a well-stoppered flask of 100 c.c. capacity, diluting to the mark, filtering from the precipitated silver sulphide, adding to 50 c.c. of the filtrate 4 c.c. of nitric acid and a few drops of ferric sulphate solution, and titrating with

N/10 ammonium thiocyanate solution; of this, not more than 2·5 c.c. should be used (this corresponds with a minimum of 0·0575 per cent. of secondary butylthiocarbimide in the spirit).

A qualitative and quantitative examination may be combined in one operation by means of the polarimeter, secondary butylthiocarbimide having a specific rotation $[\alpha]_D = + 33·43°$. Of the spirit, 100 grammes are heated with 10 c.c. of ammonia for 3 hours on the water-bath, in a flask furnished with an air condenser, the liquid is evaporated, the residue dissolved in 10 c.c. of warm water and the solution, filtered if necessary, examined in a 2 dcm. tube in the polarimeter; it should have a rotation of about 0·5° (which corresponds to 0·06515 per cent. of secondary butylthiocarbimide in the original spirit).

Concentrated Decoctions. (*Pharm. Zeitung*, 1900, 492.) The following directions are stated to yield preparations which can be kept for any length of time without undergoing a change. In each case the product represents its own weight of the drug employed.

Decoctum Senegæ concentratum. 500 grammes of the coarsely powdered root are heated on a steam-bath with 2500 grammes of water in a covered vessel for 5 to 6 hours. After this the mixture is subjected to strong pressure, the strained decoction heated with a solution of 2 grammes of dry egg albumin to the boiling point, then filtered, and evaporated to 500 c.c.

Decoctum Uva ursi concentratum. This is made like the preceding preparation, except that the pressed and strained liquor, without any addition, is at once boiled down to 425 c.c., then allowed to cool, mixed with 75 grammes of alcohol, allowed to stand for 24 hours, and then filtered.

Decoctum Frangulæ concentratum and *Decoctum Condurangæ concentratum* may be prepared in the same way as the decoction of bearberry leaves.

Note on Mistura Olei Ricini, B.P. W. A. Gregson. (*Pharm. Journ.*, 4th series, ix. 50.) The following modification of the official process is recommended as simple, speedy and effectual:— Operating on one quarter of the B.P. quantity, place 75 grains of powdered acacia in a dry mortar, add 6 fluid drachms of castor oil at once, then 3 fluid drachms of water, and mix intimately until a perfect emulsion is obtained. Now add the aqueous fluids in small quantities at a time, care being taken to maintain uniformity.

Cod-Liver Oil Emulsion prepared with Extract of Malt. H. V. Arny. (From *Bulletin of Pharmacy.*) In a report on cod-liver

oil emulsions read before the Ohio Pharmaceutical Association, the author states that extract of malt is one of the best means of masking the taste of this oil. The following formula is recommended as yielding a very uniform, palatable and permanent combination :—

	Parts.
Cod-liver oil	4
Syrup of wild cherry	2
Extract of malt	1
Sherry wine	1

Emulsify the oil by gradual addition to the extract, alternating with the syrup. Lastly, add the wine.

If any trouble is experienced in emulsification, the malt extract should be tested with litmus paper, and if it be found acid, a trace of sodium bicarbonate should be added in preparing the emulsion.

Gelatin Emulsion of Cod-Liver Oil. H. V. Arny. (From *Bulletin of Pharmacy*.) An excellent emulsion of cod-liver oil may be obtained by means of gelatin. The best results are obtained by using 10 grains of gelatin, 10 grains of tragacanth and 20 grains of sugar to 1 oz. each of cod-liver oil and water.

Assay of Cinnamon Water. M. Duyk. (*Chem. Zeit.*, xxiii. 264.) The cinnamon water is treated at ordinary temperatures with an excess of a 1 per cent. aqueous solution of phenylhydrazine hydrochloride containing 15 per cent. of potassium acetate. The mixture is thoroughly shaken, and filtered off from the precipitated hydrazone, which is washed, dried, and weighed. From 100 c.c. of cinnamon water the author obtained 0·175 gramme of hydrazone corresponding to about 1 per cent. of cinnamic aldehyde.

Syrup of Rhubarb. F. W. Haussmann. (*Amer. Journ. Pharm.*, 1899, 267.) The author suggests the following process for preparing this syrup as an improvement on the preparations of the British and United States Pharmacopœias :—Mix 4 c.c. of spirit of cinnamon, U.S.P., with 100 c.c. of fluid extract of rhubarb, U.S.P., and add 375 c.c. of water in which 10 grammes of potassium carbonate has previously been dissolved. Allow the mixture to stand for two hours, with occasional agitation, then filter and pass sufficient water through the filter to bring the volume of liquid to 475 c.c. In this dissolve 750 grammes of sugar by agitation, without heat, and strain ; finally, add sufficient water to make up the volume of the product to 1000 c.c.

Syrupus Pruni Virginianæ. F. W. Haussmann. (*Amer. Journ. Pharm.*, 1900, 71–73.) The author considers that if the present U.S.P. process for the preparation of syrup of wild cherry

is to be retained, the glycerin should be reduced to one-half and should be made a part of the menstruum, and the amount of sugar should be increased from 700 to 750 grammes.

He also finds that an excellent substitute for the U.S.P. preparation can be made by means of an acetic acid menstruum containing 1 per cent. of acetic acid. He gives the following directions:—

Acetous Syrup of Wild Cherry.

Wild cherry bark, in No. 20 powder	150 grammes
Sugar	750 grammes
Glycerin	100 c.c.
Diluted acetic acid, Water, of each a sufficient quantity to make	1000 c.c.

Mix the glycerin with 300 c.c. of a mixture composed of one part of diluted acetic acid and five parts of water. Moisten the wild cherry with a sufficient quantity of the liquid and macerate for twenty-four hours in a closed vessel, then pack it firmly in a cylindrical percolator and pour on the remainder of the menstruum. When the liquid has disappeared from the surface, proceed with a mixture of diluted acetic acid and water in the same proportion as before, until the percolate measures 450 c.c. Dissolve the sugar in the percolate by agitation without heat, strain and pass a sufficient quantity of the same acid mixture as before through the strainer to make the product measure 1000 c.c.

Syrupus Amygdalæ. F. W. Haussmann. (*Amer. Journ. Pharm.*, 1900, 226–227.) The syrup of the U.S. Pharmacopœia separates on standing. To remedy this defect the following formula is suggested:—

Sweet almond	140 grammes.
Bitter almond	40 grammes.
Acacia, in granular powder	10 grammes.
Sugar	200 grammes.
Orange-flower water	100 c.c.
Water	300 c.c.
Syrup, a sufficient quantity to make the syrup measure	1000 c.c.

Rub the almonds, previously blanched, in a mortar, with the acacia and 100 grammes of sugar, and 50 c.c. of water to a smooth paste. Mix this well with the orange-flower water and 100 c.c. of water and strain with strong expression. To the residue add 150 c.c. of water and express again. In the strained liquid dissolve the remainder of the sugar without heat and add a sufficient

quantity of syrup to make the product measure 1000 c.c. Mix thoroughly.

Syrupus Rosæ. F. W. Haussmann. (*Amer. Journ. Pharm.*, 1899, 73.) The author points out that a brighter coloured syrup, with an agreeable acidulous taste, is obtained by the addition of diluted sulphuric acid (10 c.c. per litre). It is open to the disadvantage, however, that the sugar is liable to inversion, and consequently a deposit of grape sugar may form on standing.

Syrup of Papain. (*Bull. de Pharm. de Brux.*, xliii. 279. From *Pharm. Journ.*) Two grammes of papain are dissolved in 3 grammes of distilled water with the aid of gentle heat; this solution is added to 180 grammes of syrup of orange, and the product mixed with 10 grammes of 60 per cent. alcohol.

Syrupus Ferri Iodidi. F. W. Haussmann. (*Amer. Journ. Pharm.*, 1900, 217–218.) The author's experiments were conducted with the view of preparing a syrup of greater permanence than that of the U.S.P. The following formula is suggested:—

Iron, in the form of bright wire and cut into small pieces	25 grammes.
Iodine	83 grammes.
Sugar, in coarse powder	600 grammes.
Diluted hypophosphorous acid	20 grammes.
Distilled water, a sufficient quantity to make	1000 grammes.

Introduce the iron into a flask of thin glass, having a capacity of 500 c.c., add to it 200 c.c. of distilled water and afterwards the iodine. Shake the mixture occasionally, checking the reaction if necessary by cooling, and, when the solution has acquired a greenish colour and has lost the odour of iodine, dilute it with 75 c.c. of water and heat it to the boiling point. To the boiling solution add 25 grammes of sugar, and filter it quickly upon the rest of the sugar placed in a porcelain capsule.

Stir the mixture with a glass rod, heat it to the boiling point, and, having strained the syrup through linen into a tared bottle, add the hypophosphorous acid and enough distilled water to make the product weigh 1000 grammes.

Lastly, shake the bottle and transfer the syrup to small vials which should be completely filled.

Volumetric Assay of Syrupus Ferri Iodidi. E. Rupp. (*Archiv der Pharm.*, ccxxxviii. 159. From *Journ. Soc. Chem. Ind.*)

The method, which gives accurate results, depends upon the separation of iodine by means of permanganate:—

$$10\,Fe\,I_2 + 3\,K_2\,Mn_2\,O_8 + 24\,H_2\,S\,O_4 = 10\,I_2 + 5\,Fe_2\,(S\,O_4)_3 + 6\,Mn\,S\,O_4 + 3\,K_2\,S\,O_4 + 24\,H_2\,O.$$

The excess of permanganate is decomposed by the sugar present, and the iodine separates from the clear liquid in the form of powder. Potassium iodide is then added, with the result that, on the one hand, the separated iodine is dissolved, whilst, on the other, the ferric sulphate is reduced with liberation of a corresponding amount of iodine:—

$$5\,Fe_2\,(S\,O_4)_3 + 10\,K\,I = 5\,I_2 + 10\,Fe\,S\,O_4 + 5\,K_2\,S\,O_4.$$

5 grammes of the syrup after diluting with about 10 c.c. of water are treated with 10 c.c. of dilute sulphuric acid and then 1 per cent. permanganate solution added until the liquid which remains on the walls of the vessel, after shaking, shows a violet coloration. After standing for three hours with frequent shaking, 1 to 2 grammes of potassium iodide are added, and after standing for another hour in the dark, the free iodine is titrated with one-tenth normal thiosulphate solution (1 c.c. = 0·20666 per cent. of $Fe\,I_2$).

Liquor Bismuthi. R. C. Cowley and J. P. Catford. (*Pharm. Journ.*, 4th series, ix. 604–605.) The authors suggest the following as the best working formula for preparing one litre of liquor bismuthi:—

Bismuth. Oxynitrate, 70·0 gm. Acid. Nitric (s.g. 1·42). Aq. Destill. aa 50·0 c.c. Acid. Citric, 50·0 gm.	Bicarbonate Potash, 103·0 gm.; or Soda, 86·5 gm.	Or, Solution of *Sub*carbonate; or, Hydrate, *q.s.* equivalent to 128·0 c.c. of the diluted Nitric Acid.

The bicarbonates may be weighed as pure, being fairly constant in purity, but subcarbonates or hydrates, being variable in strength, are best made into solution, 10 to 20 per cent. (soda crystals 30 per cent.), and titrated with the diluted acid. If 128 minims of the diluted nitric acid are neutralised by x minims of the alkali solution, then x c.c. of the alkali solution are required. If liq. ammoniæ is to be used, deduct one-tenth or titrate with 115 minims of the acid instead of 128 minims; or, if a burette is used, 11·5 c.c. instead of 12·8 c.c. Dissolve the bismuth in the diluted nitric acid by gently warming, add the citric acid dissolved in a little water (and if a carbonate is used two-thirds of it may be

mixed with the citric acid); lastly, add gradually the alkali solution, stirring well; dilute with hot water to about a litre, cool, filter, and wash free from nitrate. Pour on to the citrate 60 c.c. of liq. ammon. (10 per cent.) diluted to 200·0 c.c. with water; return the ammoniacal filtrate until all the bismuth citrate is taken up then dilute to a litre or to the required specific gravity, 1·07.

New Method for Preparing Mercurial Ointment. A. Archetti. (*Pharm. Zeitung*, 1900, 415.) The author's suggestion is based on the fact that hydrogen peroxide reduces mercury salts, throwing down metallic mercury in a state of exceedingly fine division. A solution of one gramme of mercuric chloride is mixed with 25 c.c. of a 3·6 per cent. solution of hydrogen peroxide, and the mixture is heated to the boiling point. 10 to 15 c.c. of a 50 per cent. solution of caustic soda are added to the warm mixture, which is then heated again for a few minutes and allowed to cool. The liquid is decanted from the precipitate, the latter repeatedly washed (taking care not to let it get dry), and finally mixed with the proper proportion of fat. The product is stated to contain the mercury in a much more finely divided condition than that obtained by any of the usual processes.

NOTES AND FORMULÆ.

PART III.

NOTES AND FORMULÆ.

Elixir of Boldo. (*Rev. Med. Pharm.*, vi. 183. From *Pharm. Journ.*) Crushed boldo leaves, 30 parts; alcohol (60 per cent.), 120 parts; Madeira wine, 500 parts; simple syrup, 350 parts; distilled water, *q.s.* to produce 1000 fl. pts. Macerate the boldo in the alcohol for 48 hours, then add the wine and macerate for 8 days; strain and press, then add the syrup. The residue is treated with sufficient water to bring up the volume of the expressed liquid to 1000 parts; allowed to stand for some days, then filtered. It is given in atonic dyspepsia, as a stomachic, in doses of a tablespoonful daily after meals.

Elixir of Hamamelis. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 102.)

Fluid extract of hamamelis . . .	3 parts.
Syrup of bitter orange peel . . .	50 „
Tincture of vanilla	2 „
Alcohol	18 „
Distilled water	27 „

Dose: a tablespoonful 3 times a day.

Elixir of Pancreatin. (*Rev. Med. Pharm.*, vi. 74.) 10 grammes of pure pancreatin are dissolved in 500 grammes of Malaga wine, the solution is mixed with 400 grammes of simple syrup and 90 grammes of 80 per cent. alcohol.

Elixir of Terpin Hydrate. F. A. Sieker. (*Pharm. Review*, xvii. 307.) 17·5 grammes of terpin hydrate are dissolved in 400 c.c. of alcohol with the aid of gentle heat; 400 c.c. of glycerin are then added and a sufficient quantity of distilled water to make up 1000 c.c. The product keeps clear at ordinary temperatures; at low temperatures a portion of the hydrate may crystallise out, but this can be readily re-dissolved by warming.

Colourless Tincture of Iodine. (*Chemist and Druggist*, lv. 244.) The following is suggested as a convenient and expeditious process for the preparation of this tincture:—

Sodium iodide	48·9 grammes.
Ammonium iodide.	47·3 grammes.
Liquid ammonia	10 c.c.
Distilled water	155 c.c.
Rectified spirit to make	1000 c.c.

Vinum Creosoti Compositum. (From *Apoth. Zeitung.*) This preparation is recommended in the early stages of pulmonary tuberculosis, and is prepared according to the following formula :—

Creosote	3 grammes.
Tincture of gentian.	30 „
Proof spirit	250 „
Sherry wine sufficient to make	1 litre.

A tablespoonful to be taken two or three times a day.

Vinum Cascaræ Sagradæ. (*Pharm. Zeitung*, 1900, 297.) 150 grammes of Malaga wine are mixed with a solution of 0·2 of gelatin in 2 grammes of water ; and to this solution are added 100 grammes of fluid extract of cascara sagrada and 50 grammes of syrup of orange peel. The mixture is allowed to stand for 8 days and then filtered.

Kola Milk. L. Bernegau. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 201.) One pound of kola powder is mixed with five litres of cold water and allowed to stand over night. In the morning this is boiled for fifteen minutes and the liquid expressed from the mass, the expressed liquid filtered and sterilized. To this liquid are added about 97·5 litres of sterilized skim milk, and the whole is put up aseptically in bottles or tin cans.

Lemonade for Diabetic Patients. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 341.)

Citric acid	15 grains.
Glycerin	11 drachms.
Brandy	11 „
Distilled water	16 ounces.

Pills of Uva Ursi and Salol. O. Werler. (*Pharm. Centralh.*, xl. 164.) A combination of uva ursi and salol acts as a disinfectant, astringent and tonic, and is recommended by the author in diseases of the bladder and urinary organs. It is given in the form of pills containing equal weights of salol and desiccated extract of bearberry, of which one, two or three are taken three times a day after meals.

Flexible Collodion. W. T. Caldwell. (*Pharm. Era*, xxii. 667.) The author suggests the following modified formula on

account of the greater elasticity and suppleness of the product:—Glycerin, 2 parts, by weight; Venice turpentine, 5; lard, 10; and collodion, 83 parts. When applied to the skin it leaves a film which does not crack or contract.

Hæmostatic Collodion. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 183.) This preparation contains 20 per cent. of tannin and is made by first triturating the tannin with a little glycerin, then adding some alcohol and ether, and finally the collodion. If it be desired to combine anodyne with the hæmostatic properties of the preparation, a little morphine may be added to the tannin before trituration with the glycerin. The product in either case may be rendered antiseptic by the addition of a small quantity of carbolic acid.

Caustic Collodion. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 593.) 50 grammes of zinc chloride are dissolved in 12 c.c. of alcohol and 3 to 5 c.c. of hydrochloric acid; the solution is mixed with 25 c.c. of collodion, and 15 c.c. of ethyl ether, and a few drops of solution of methylene blue are then added to the mixture.

Solution of Mercuric Benzoate for Hypodermic Use. MM. Desesquelle and Bretonneau. (*Journ. de Pharm. d'Anvers*, lv. 188.) The authors find that mercuric benzoate is readily soluble in solution of ammonium benzoate, and that such a solution is well adapted for subcutaneous injections, as it does not cause pain, forms no precipitate with proteids, and is less toxic than mercuric chloride. He suggests the following proportions:—

Mercuric benzoate . . .	60 centigrammes.
Ammonium benzoate . .	3 grammes.
Distilled water sufficient to make .	60 grammes.

Mercurial Soap Ointment. (*Pharm. Centralhalle*, from *Therapie der Gegenwart.*) This preparation has the following composition:—Purified mercury 33·33 parts, powdered white olive oil soap 12·66, clarified suet 18·00, and purified lard 36·00.

Medicated Soaps. M. Voiry. (*Bull. Soc. Pharm. Brux.*, 1899, 411.) As a basis for medicated soaps the author uses a preparation which he calls *sapo simplex*, prepared as follows:—900 grammes of cocoa-nut oil are boiled in a porcelain dish with 600 grammes of caustic soda solution of 10° B. until the mixture assumes a cream-like appearance; 375 grammes of caustic soda solution of 20° B. are then added, and the boiling is continued until a small portion of the mixture, taken out and quickly cooled, solidifies. 500 c.c. of water are now added to the mixture, the

whole is again heated to the boiling point, and 375 grammes of sodium chloride are added. The soap which thus separates on the surface of the liquid is removed after cooling by decantation, washed twice with a 20 per cent. solution of sodium chloride and then with cold water, and freed from excess of water by pressure. The resulting product has the consistence of a paste, and is used for the following medicated soaps:—

Boracic soap.—900 grammes of *sapo simplex* and 200 grammes of finely powdered borax are intimately mixed together so as to obtain a perfectly uniform mass, which is then moulded into pieces of 100 grammes each and dried.

Tar soap.—100 grammes of tar are gradually added to and intimately mixed with 900 grammes of *sapo simplex*. In the same manner *ichthyol soap* and *naphthol soap* may be prepared.

Carbolic soap.—50 grammes of colourless carbolic acid are dissolved in 25 grammes of 90 per cent. alcohol, and the solution is gradually incorporated with 950 grammes of *sapo simplex*.

Sublimate soap.—5 grammes of corrosive sublimate are dissolved in 80 grammes of 90 per cent. alcohol, and the solution is gradually incorporated with 900 grammes of *sapo simplex*.

Sulphur soap.—100 grammes of sublimed sulphur, freed from adhering sulphuric acid by washing with water, are intimately mixed with 900 grammes of *sapo simplex*, and moulded into pieces of 100 grammes each and dried.

Superfatted Cod-Liver Oil Soap. (*Pharm. Centralh.*, xl. 707.) Pure soft soap free from odour, is mixed with 20 to 40 per cent. of cod-liver oil. The product is used for external application in tuberculosis.

Liquor Capsici Compositus. (*Pharm. Zeitung*, 1900, 297.) This preparation is intended as a substitute for "Pain Expeller," and is made according to the following formula:—100 parts of powdered black pepper, 100 of powdered capsicum, 25 of Castile soap, and 25 of camphor are macerated with 800 parts of rectified spirit for 8 days; the product is then pressed and strained, the strained liquid mixed with 5 parts of oil of rosemary, 5 of oil of lavender, 5 of oil of cloves, 1 part of oil of cinnamon and 200 parts of solution of ammonia. The mixture is then filtered.

Formulæ for Menthol Preparations. (*Pharm. Post*, xxiii. 65; and *Zeitschr. des oesterr. Apoth. Ver.*, 1900, 65–66.) *Menthol Vinegar.*—Menthol, 3 parts; vinegar, 97 parts; to be added to gargles.

Menthol Toothache Drops.—Menthol, 8 parts; chloroform, 8;

alcohol (95 per cent.), 84 parts. To be applied on wool to the decayed tooth.

Menthol Cholera Drops.—Menthol, 6 parts; tincture of ginger, 8; tincture of opium, 10; spirit of ether, 76 parts. Take 10 to 15 drops every half-hour.

Menthol Ice.—10 parts of spermaceti are melted with 10 parts of liquid paraffin, and 10 parts of menthol are added. To be applied to the nostrils for cold in the head.

Menthol Oil.—16 parts of menthol are dissolved on a water-bath in 84 parts of olive oil.

Menthol Wine.—2 parts of menthol are dissolved in 6 parts of cognac, 6 parts of glycerin and 86 parts of Tokay wine are added.

Mentholin.—10 parts of menthol are dissolved in 78 parts of alcohol (95 per cent.) and 12 parts of solution of ammonia added.

Menthol Snuff.—15 parts of menthol, 30 of boric acid and 55 parts of ammonium chloride are mixed together.

Menthol Chloral.—Equal parts of menthol and chloral hydrate are melted together at 30° C. The resulting oily liquid is applied locally in tooth- and face-ache.

Menthol Ointment.—5 parts of paraffin oil are melted with 85 of lanolin, and 10 parts of menthol added. It is applied to the forehead for headache and migraine.

Benzoated Camphor Ice. (*Chemist and Druggist*, lvi. 393.)

Pure lard	1¼ oz.
Lanolin	½ oz.
Spermaceti	2½ oz.
Camphor	1 oz.
Almond oil	2 oz.
Benzoic acid	6 gr.
Oil of cajuput	10 drops.

Melt the lard, lanolin, and spermaceti, dissolve the camphor in the oil with heat, and add to the melted fats. When nearly cold stir in the benzoic acid and the oil of cajuput and pour into moulds.

Iodol-Peruvian Balsam Ointment. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 2.) This ointment is used for various skin diseases, and is composed of 0·5 gramme of iodol, 0·5 gramme of Peruvian balsam, and 5 grammes of vaselin. It is advisable to add 0·05 gramme of sodium thiosulphate dissolved in a drop of water, in order to prevent the development of a black colour, which otherwise is liable to take place through the liberation of part of the

iodine and the formation of black compounds of the free iodine with constituents of the Peruvian balsam.

Menthol Opodeldoc. (*Deutsch. Amer. Apoth. Zeit.*, xix. 157.)

Soft soap	20 grains
Camphor	8 „
Menthol	2 „
Distilled water	2 „
Tincture of arnica sufficient to make	1 fluid oz.

Dissolve at a gentle heat.

Linimentum Capsici Compositum. V. Fassati. (*Pharm. Centralh.*, xl. 132.) 500 grammes of capsicum fruits are moistened with dilute tragacanth mucilage, dried at a gentle heat and ground to a coarse powder. This is mixed with 125 grammes of alcohol and the same quantity of ether, macerated in a closed vessel, then percolated with alcohol until 1250 grammes of percolate have been obtained. 500 grammes of camphor are dissolved in the percolate, and the solution is then mixed with 25 grammes of solution of ammonia (sp. gr. 0·91), 10 grammes of oil of thyme, and 10 grammes of oil of lavender.

Ointment Gelatins. M. Pelagatti. (*Pharm. Centralh.*, xl. 76. From *Pharm. Journ.*) The author recommends ointment gelatins for the treatment of skin diseases, prepared as follows:—White zinc gelatin, 30; glycerin, 20; water, 50; pure lanolin, 48; zinc oxide, 20 parts. The lanolin is mixed warm with the gelatin dissolved in water, and poured into moulds. When cool, the ointment gelatin is easily taken out of the moulds and stored in boxes, or in paraffin paper; it does not become hard. If needful, as much as 40 per cent. of metallic mercury can be incorporated with the basis by first triturating 16 parts of mercury with 8 parts of lanolin; the same process is followed with resorcin, salicylic acid, and litharge. Before use, the preparation is dissolved on the water-bath, painted thinly on the affected skin, and well dusted over with lycopodium; in five minutes the application will be quite dry.

Alcohol as a Disinfectant. MM. Salzwedel and Elsner. (*Berl. klin. Wochenschr.*, June 4, 1900.) The authors find that alcohol of 50 to 55 per cent. is very useful for disinfecting the hands of surgeons before operations. They find it to be an active antiseptic specially suited for attacking micro-organisms enclosed in a fatty medium. Its activity appears to be increased by acidulation, but diminished by alkalisation; it is also diminished by heat, which reduces the strength owing to the rapid evaporation

of the alcohol. The authors recommend that the hands, after washing with soap and water, be well soaked without previous drying in 80 per cent. acidulated alcohol (which thus becomes diluted to about the proper strength by the water remaining on the hands) before the performance of an operation.

A New Antiseptic. A. Zimmermann. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 98–99, from *Apoth. Zeitung.*) The author has introduced a new antiseptic, prepared by mixing paraformaldehyde with a hygroscopic salt such as calcium chloride, and with a dry, porous or sandy substance, such as a mixture of infusorial earth and sawdust. The water absorbed by the calcium chloride reacts with the paraformaldehyde, thus yielding formaldehyde, which produces the desired disinfecting and deodorising effect. The calcium chloride may also be used in the form of solution, which is then absorbed by the sawdust, etc.

A New Guaiacol Preparation. A. Einhorn. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 99, from *Münch. Med. Wochenschr.*) The author, in conjunction with Heinz, has prepared a hydochloride of diethylglycocoll-guaiacol, the merits of which have been investigated by Buchner. It is a readily soluble entirely non-toxic and non-corrosive compound, which splits up in the organism with the liberation of guaiacol. It possesses antiseptic and anæsthetic properties and may be safely given internally in doses of 3 grammes in wafers, 3 or 4 times a day. It may also be administered subcutaneously. It is chiefly recommended in tuberculosis, and promptly arrests the diarrhœa of patients suffering from tubercular affections. It also proves very useful as a deodorising agent in stomatitis, septic conditions of cancer patients, etc. As a mild antiseptic and anæsthetic it has also proved very serviceable in bladder affections and in ophthalmic practice.

Tasteless Quinine Derivatives. Zimmer & Co. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 8.) The authors have introduced a series of compounds consisting of derivatives of the cinchona alkaloids in the form of white almost tasteless powders which are very soluble in alcohol, ether, chloroform, or benzol, but only slightly soluble in water. Their salicylates are very soluble in ether. The general formula of the compounds may be expressed, in the case of the quinine derivatives, as follows :—

$$CO\begin{cases} C_{20}H_{23}N_2O_2. \\ X. \end{cases}$$

In this formula X represents the residue of an amine base.

Chloroform Water for Obviating the Secondary Effects of Chloroform Narcosis. M. Weber. (*Bull. de Thérap.*, cxxxvii. 488. The author states that by treating the patient for as long as possible before operation with daily doses of chloroform water a complete immunity may be obtained from the distressing and often dangerous secondary symptoms, such as nausea, vomiting and general excitement, which follow chloroform narcosis. He strongly advocates the treatment in all cases when this anæsthetic is to be used in surgical operations. In order to mask the taste of the chloroform, he advises the employment of the following mixture: —Chloroform water, 200 grammes; oil of peppermint, oil of anise, of each 4 drops. Mix, set aside for twelve hours, and filter. The author has found this treatment to be very successful.

Tincture of Stramonium in Nasal Catarrh. (*Chemist and Druggist*, lvi. 359.) A writer in the *Indian Medical Record* speaks very highly of the use of tincture of stramonium in this complaint. He says 15 minims of the tincture will at once stop the sneezing and catarrh if taken at the very commencement of the attack. In other cases the dose may have to be increased to 20 or 30 minims as the patient becomes tolerant of its action, and it may have to be repeated two or three times. Seldom are more than three doses required. Belladonna, which is physiologically allied to stramonium, does not seem to have a like action in this particular condition.

Petrolatum as a Laxative. H. Upson. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 69, from *Phil. Med. Journ.*, 1899.) The author states that a pure white petrolatum is a most efficient and unobjectionable laxative, as it acts wholly in a mechanical manner without causing any irritation whatever. The dose is from 50 to 100 grammes.

Treatment of Chronic Local Eczema with Caustic Alkali and Copper Sulphate. E. Spiegler. (*Brit. Med. Journ.*, May 5, 1900; *Epit.*, No. 351.) The author gives the following method for treatment of that chronic form of local eczema which, becoming papular and squamous, extends slowly year by year, heals and recurs again and again. The whole limb is well washed with soap and water, and then dried. The eczematous parts are energetically rubbed over with a swab dipped in 50 per cent. caustic soda solution. They are then washed with water, and painted with a saturated solution of copper sulphate. A bandage is applied over cotton wool, and healing takes place in about two weeks. Should the rough upper layers crumble away they can be easily removed

with 3 per cent. boracic vaselin. One application is generally sufficient, but another will be needed if the soda solution has not been thoroughly rubbed in. Except with the "eczema circa anum" the process is almost painless. In this latter variety, the patient should lie in bed; in the former this is not at all necessary.

Gelatin Serum for Hypodermic Injection. (*Petit Mon. Pharm.*, xlix. 3303. From *Pharm. Journ.*) The value of gelatin as a hæmostatic is causing it to be freely prescribed on the Continent, both as a local application and for hypodermic injection. For the latter purpose a one or two per cent. solution in artificial serum is generally employed. Thus, a general formula for hypodermic injection of gelatin is—Finest white gelatin, 10 to 20 grammes; sodium chloride, 5 grammes; pure sodium carbonate, 2 grammes; distilled water to 1000 grammes. The solution should be thoroughly sterilised. For local application a stronger solution of pure white gelatin, 10 grammes; sodium chloride, 10 grammes; distilled water, 500 grammes is employed. The gelatin in both cases is cut up small, and dissolved in the saline solution with a gentle heat, filtered through a Chardon filter, previously washed with hot distilled water, then filled into suitable flasks, plugged with cotton wool, and sterilised in the autoclave at a temperature of 100° C. Care must be taken not to exceed 105° C. during this sterilisation, or the hæmostatic power of the gelatin will be destroyed. Sterilisation may be effected in a water-bath, but in this case, great care is necessary to avoid deterioration of the coagulating properties of the gelatin.

Lactic Acid in Ringworm. (*Med. Press*, lxxxvii. 432. From *Pharm. Journ.*) Balzer finds that lactic acid gives good results in many cases of ringworm of the scalp. The parts are first thoroughly washed with a mixture of alcohol and ether, and then rubbed twice a day with a solution of syrupy lactic acid, 1 fl. part, in alcohol, 2 fl. parts. The rubbing is continued until redness is obtained; the pain occasioned by the application is not very sharp, and subsides in a quarter of an hour. To complete the treatment, the patient is directed to wash the parts with a 1–2000 solution of mercuric chloride.

Formalin as an Application for Insect Bites. M. Gonin. (*Therapist*, ix. 213, from *Apoth. Zeit.*) The local application of a strong solution of formaldehyde, if resorted to without delay, is stated by the author to prevent or promptly relieve the irritation and inflammation usually resulting from insect bites.

Paraform as a Remedy for Warts. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 473.) Paraform (see *Year-Book of Pharmacy*, 1894, 234) is recommended by Meuse for the treatment of warts, and also of papular syphilides. It is said to be especially useful in palmar psoriasis. Its action extends deeply into the skin. It is recommended to be used in the form of a solution of 3 parts of paraform in 27 parts of collodion, which is applied three times a day by means of a brush. The epidermis generally peels off after two or three days.

Potassium Permanganate as a Remedy for Checking an Incipient Cold. M. Nassauer. (*Practitioner*, xlii. 635.) The author states that incipient coryza can be rapidly checked by thoroughly rinsing the nose with a weak solution of potassium permanganate, which acts as a germ destroyer. For this purpose a few drops of a strong solution of this salt are added to warm water so as to impart a pale pink colour to the latter. Both nostrils are then frequently rinsed with this weak solution, and in the intervals small plugs of cotton-wool saturated with the solution are left in the nostrils.

Acetyl-Leucomethylene Blue. G. Cohn. (*Pharm. Centralhalle*, from *Arch. der Pharm.*) This colourless derivative of methylene blue is stated by the author to be free from the undesirable secondary effects of the latter. The therapeutic efficacy of methylene blue, moreover, is found to be increased by the introduction of an acetyl group. The product crystallises in hard, tasteless and nearly colourless needles melting at 179–180° C. It is difficultly soluble in benzol or ether, freely soluble in hot glacial acetic acid and in dilute mineral acids, and is precipitated by ammonia from its acid solutions in white flakes. With concentrated sulphuric acid it forms a yellow solution which changes to olive and then to green on heating, and turns blue on the subsequent addition of water (through regeneration of the original colouring matter). Leucomethylene blue imparts a greenish colour to urine, and is almost free from toxic properties.

The author also reports on the corresponding acetyl-leucoethylene blue.

Æthol. (*Pharm. Zeitung*, from *Berlin. klin. Wochenschr.*) The name æthol is applied by Grimm to cetyl alcohol, which is used in the form of powder, mixed with boracic acid either in the proportion of 1:1 or 1:5, and is applied for chapped hands, chilblains, eczema, and prurigo.

Amidosulphonal. T. Posener. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 615.) Amidosulphonal is obtained by converting phthalimido-acetone-ethyl-mercaptol by oxidation into phthalimido-sulphonal, and then decomposing the latter by the action of acids into phthalic acid and amidosulphonal. The product crystallises in pale yellow prisms, which are soluble in water and alcohol, but insoluble in ligroin, and melt at 97° C. It is introduced as a therapeutic agent.

Ammonio-Arsenio-Citrate of Iron. (*Merck's Report*, 1900, 74.) This preparation contains 1·4 per cent. of arsenious acid, and 15 to 18 per cent. of metallic iron, and is introduced as a valuable antiperiodic, which may be administered either internally or by subcutaneous injection. It forms green scales which are very soluble in water.

Anæsthol. (From *Pharm. Zeitung.*) This preparation, which has been introduced as a local anæsthetic in dental operations, is stated to be a solution of methyl chloride in ethyl chloride.

Aniodol. (*Bull. Comm.*, xxviii. 132. From *Pharm. Journ.*) Under this name a solution of formolic and allylic derivatives has been introduced, which is stated to be a powerful bactericide. Its germicidal power is said to be between 1:4000 and 1:5000, and, for some bacteria, as little as 1:6000 is fatal. For sterilising instruments a 1:2000 solution is recommended, in which strength aniodol is stated to be without action on the hands of the operator. For injections and dressings a 1:5000 solution is sufficient; a more concentrated form should not be used, since, in larger doses, it has a tendency to destroy the repairing elements of wounds and thus hinder healing.

Antiherpin. (*Pharm. Zeitung*, and *Zeitschr. des oesterr. Apoth. Ver.*, 1900, 481.) Antiherpin is the name given by J. Rössler to a mixture of 100 parts each of tar and oil of rape, and 10 parts of Peruvian balsam. The mixture is intended for the treatment of herpes and similar parasitic skin diseases.

Antimellin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 576.) This name is applied by Börsch to a glucoside isolated by him from the fruit of *Syzygium jambolanum*. It is a yellow crystalline powder, and is stated to be valuable in the treatment of diabetes. The chemical constitution of this substance is being investigated.

Arsenical Casein. (From *Chem. Zeitung.*) This preparation is obtained by suspending casein in alcohol and boiling the mixture for several hours with an aqueous or alcoholic solution of a

halogen compound of arsenic. The product is soluble in water and in alkalies, and is precipitated from its solutions by acids. It is stated to contain the arsenic in an organically combined condition.

Atrabilin. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 204.) Atrabilin is a preparation from the suprarenal glands, which is described as a yellow slightly opalescent liquid having a faint odour resembling that of meat extract. According to Wolffberg, it produces all the symptoms caused by cocaine with the exception of the mydriasis and anæsthesia. The remedy is indicated in ophthalmic practice in cases of deep ciliary injection and functional hyperæmia due to excessive weeping or eye strain. It is prescribed in the form of a 20 per cent. solution.

Basicine. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 153, from *Pharm. Zeitung.*) This preparation is stated by Kreidmann to be a compound of quinine hydrochloride and caffeine, prepared by melting 2 parts of the quinine salt with 1 part of caffeine. It is most readily soluble in water, and its solution is recommended either by itself, or in combination with other alkaloids, in acute infectious diseases, malaria, chronic articular rheumatism, gout, etc. In doses of 0·1–0·2 gramme basicine is also stated to be a potent remedy for migraine, influenza, insomnia, etc. It is reported to greatly exceed quinine in its therapeutic efficacy and to be free from the unpleasant secondary effects of the latter. For some purposes it is also used externally in the following combination:—Basicine, 5 grammes; chloroform, 37·5; alcohol, 12·5; and olive oil, 45 grammes. To this combination the name *basicine oil* is given. This oil is to be chiefly applied in cases in which the internal or subcutaneous administration of quinine compounds disagrees with the patient, but it is also recommended in conjunction with the internal treatment in chronic complaints.

Basicine has been chemically examined by B. H. Paul and A. J. Cownley (*Pharm. Journ.*, 4th series, x. 438), who arrive at the conclusion that this preparation is a mechanical mixture rather than a chemical compound. They regard the fact that a mixture of the two components named is so very much more soluble than either of its constituents alone as of chemical interest, quite apart from any medicinal value assigned to the combination.

Calmin. (From *Pharm. Zeitung.*) This preparation is introduced by A. Cantzler as a combination of antipyrine and heroine. It is recommended for the treatment of whooping-cough, asthma, and neurotic conditions.

Carnigen and Carnos. (*Chem. Zeitung*, 1899, 806.) Carnigen is stated to be a soluble and highly nutritious substance prepared in the form of a powder from perfectly fat-free raw meat of the best quality. It is introduced as a diatetic remedy and restorative in low states of the system.

Carnos is a food preparation in the form of an extract prepared by boiling pressed yeast with water until it has completely lost its cellular structure. After cooling to 60° C., fresh malt amounting to $\frac{1}{6}$ of the weight of the yeast is added, and the mixture is kept at this temperature for two or three hours. The liquid is then neutralised with sodium carbonate or chalk, allowed to settle, then filtered, and evaporated to the consistence of an extract. In order to render the preparation more palatable, salt and spices may be added according to taste.

Cassaripe. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 217.) This name is used in the Antilles for the inspissated juice of the root of *Manihot utilissima*, the bitter cassava. This root, in its fresh state, is well known to yield, besides arrowroot and tapioca sago, a very poisonous juice, the toxicity of which is due to the active principle, manihotoxin, which, according to Peckoldt, is destroyed on boiling or by fermentation. Cassaripe, therefore, is likewise non-poisonous; it possesses antiseptic properties, and is used by the natives of Brazil and the Antilles as a meat preservative. According to S. D. Risley, it is a valuable remedy in the treatment of some ophthalmic diseases, especially in ulcerated conditions of the cornea and in purulent discharges from the conjunctiva. In such cases it is applied in the form of an ointment containing 10 per cent. of cassaripe.

Cayaponin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 323.) Cayaponin is an alkaloid extracted from *Cayapona globulosa*, nat. ord. *Cucurbitaceæ*, which, in doses of a few milligrammes, acts as a drastic purgative.

Cephalin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 323.) Cephalin is a trade name given to a mixture of 2 parts of caffeine, 2 of sodium salicylate, 5 of antipyrine and 5 of ground coffee. The dose is 0·25 gramme.

Chielin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 184.) This name is given to an extract of tulip bulbs, which, in combination with olive oil, is recommended as an external application for a variety of skin diseases.

Chloretone, a new Hypnotic. (*Therap. Gaz.*, xxii. 738 and 758. From *Pharm. Journ.*) Chloretone, tri-chlor-tertiary butyl alcohol,

has been brought forward by Houghton and Aldrich as an anæsthetic and hypnotic. Applied locally, in aqueous solution, to lacerated wounds or burns, it acts very efficiently in lessening pain, while it possesses distinct antiseptic properties. Internally, it relieves gastric pain and vomiting, and has proved specially useful in this respect in a case of gastric carcinoma. Experiments have shown that it renders the mucous membrane of the alimentary canal insensible to irritants. As a hypnotic, it has been specially successful in cases of persistent insomnia in the aged, and in cardiac diseases with renal complications and high arterial tension. It has succeeded in many instances where morphine, chloral, and other hypnotics have failed. The usual dose given is from 6 to 20 grains, in tablets, followed by a draught of water or of milk.

Chlorosonin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 323.) This preparation is a combination of chloral hydrate and hydroxylamine, which, on treatment with water or gastric juice, splits up into its two constituents. Its physiological action is that of chloral hydrate.

Creosin. (From *Pharm. Zeitung.*) This name is given by Bosio to a creosote preparation containing iodine, calcium hypophosphite and Peruvian balsam. It is a clear, yellowish liquid, soluble in water, which is stated to be free from the objectionable taste and the caustic action of the creosote.

Creosote-Ichthyol. (*Pharm. Journ.*, 4th series, ix. 355.) This is the name given by H. Goldmann to a mixture composed of creosote carbonate, 15 parts; ichthyol, 15 parts; glycerin, 30 parts; peppermint water, 10 parts. The mixture is useful in tuberculosis, in doses of from 20 to 30 drops (with wine or lemonade) three times daily; for children, 10 drops three times daily is sufficient.

Crurin. (*Therap. Monatsh.*, 1900, No. 1.) The name crurin is given to quinoline-bismuth-sulphocyanide, which is employed as an antiseptic in ulcerative processes. It has the composition $(C_9H_7N \cdot HSCN)_2Bi(SCN)_2$, melts at 76° C, and occurs as a coarse powder of reddish yellow colour, and a rather acrid taste. It is insoluble in alcohol, water, and ether. The powder is very stable, but it is decomposed by heating with dilute mineral acids or by treatment with an excess of cold water. When dusted on secretions it forms a yellowish or brown scab, under which the wound rapidly heals.

Cupri-Aseptol. (*Merck's Report*, 1900, 53.) This preparation is employed in veterinary practice as a hæmostatic, and is a copper

compound of phenol-sulphonic acid in the form of small bluish-green opalescent crystals which are soluble in water.

Cyssatit. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 124, from *Bull. de Pharm. de Lyons.*) The name cyssatit is applied to an earth obtained from Auvergne, which appears to be identical with kieselguhr.

Dithan. (*Pharm. Centralh.*, 1899.) This is a trade name applied to a preparation said to be identical with trional.

Ecthol. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 576.) This preparation is a new antiseptic which is stated to contain the active principles of *Echinacea* and *Thuja*.

Egols—New Antiseptics. E. Gautrelet. (*Comptes Rendus*, cxxix. 113, 114.) By nitrating the parasulphonic derivatives of phenols, orthonitroparasulphonic acids are obtained, which readily combine with 1 atom of mercury for each 2 atoms of the phenol present. By this reaction the author has obtained the orthonitro-phenol-cresol- and thymol-parasulphonates of mercury and potassium, to which the generic name of *egol* is given, each compound being distinguished by a prefix indicating the phenol from which it is derived, thus: *phenegol*, *cresegol*, *thymegol*. The egols are very stable compounds, from which mercury can be separated only by heating with soda-lime or by treating with potassium chlorate and hydrochloric acid. They form red-brown powders, are difficult to crystallise, and dissolve in water, but not in strong alcohol. The aqueous solutions are odourless, neutral, and non-irritant, do not coagulate albumins, are not decomposed by organic substances, and precipitate the toxins. They are not toxic, as, when introduced hypodermically, 2 grammes per kilo. of the weight of the animal are required to cause death, but are powerful bactericides, 4 grammes per 1000 introduced into a culture preventing all bacterial growth.

Epicarin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 124.) Epicarin is an acid condensation product of cresotic acid and β-naphthol, which is capable of forming readily soluble neutral salts, whereas β-naphthol only yields alkaline and more or less corrosive phenols. It possesses the full therapeutic properties of naphthol, over which it has the advantage of greater solubility and comparative freedom from toxic and irritant action. It is a reddish-yellow powder which has a slight odour of acetic acid, and is readily soluble in alcohol, ether, and vaselin oil. Its readily soluble sodium salt may also be used in the place of the free acid. Kaposi employs a 10 to 20 per cent. ointment of epicarin or of its sodium salt, or in some

instances a 10 per cent. solution in water containing sodium hydrate, or a 10 to 15 per cent. alcoholic solution. It has proved useful in all skin diseases in which naphthol is serviceable, such as scabies, herpes tonsurans, prurigo, ichthyosis, psoriasis, and acute and chronic eczema.

Eugastrin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 974.) This preparation is introduced by Carossa as a potent remedy in pulmonary tuberculosis. It is stated to be the active constituent of condurango bark, and is recommended to be administered in the form of pills, in combination with pilocarpine. The dose is not mentioned.

Ferratose. (From *Pharm. Zeitung.*) The name ferratose, or liquor ferratini, is given by Boehringer to a solution of ferratin, which is used for anæmia, and is stated to have the advantage over other liquid iron preparations of not discolouring the teeth.

Fortoin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 248, and 323.) This preparation is obtained by the action of formaldehyde on cotoin, and is strongly recommended as a remedy for diarrhœa in doses of 0·25 gramme 3 times a day. It forms fine yellow tasteless crystals or a yellow powder, with an odour resembling that of cinnamon. Its melting point is about 211 to 213° C. It is readily soluble in chloroform, acetone and glacial acetic acid, difficultly soluble in alcohol, ether and benzol; insoluble in water and easily soluble in alkalies. In addition to its use in diarrhœa it has also been employed in gonorrhœa and in purulent conditions of the tonsils. For the last-named purpose it is used as an emulsion composed of 0·5 gramme of fortoin, 5 c.c. of alcohol and 45 c.c. of water, which is applied locally with a camel-hair brush.

Gasterin. (*Münch. Med. Wochenschr.*, 1900, 407, and *Amer. Drugg. and Pharm. Rec.*, 1900, 273.) Gasterin is a preparation obtained by Frémont from the gastric juice of the dog, and is recommended as very valuable in all affections of the stomach with the exception of cancer. It is stated by Le Gendre to have given excellent results in many cases where other remedies had failed. Linossier believes that the good results observed are due to the hydrochloric acid and pepsin present, which are found in the gastric juices of the dog in much larger quantities than in the medicaments ordinarily prescribed.

Glycosolvol. (From *Pharm. Zeitung.*) This name is given to a chemical combination of trypsin with theobromine oxypropionate, which is strongly recommended as a remedy for saccharine diabetes.

Gonal or Gonorol. (*Pharm. Journ.*, 4th series, x. 333.) This trade name is given to an almost pure santalol, and is obtained by saponification of the crude oil of sandalwood and subsequent fractional distillation *in vacuo* or by the aid of superheated steam (see also abstract of article on East Indian sandalwood oil by H. von Soden and F. Müller in this volume). It is a colourless oil with a faint odour resembling that of the sandalwood oil, and its boiling point is between 303° and 305° C. Its specific gravity is 0·978 to 0·980, at a temperature of 15° C. It is readily soluble in three parts of 70 per cent. alcohol at a temperature of 20° C., and the solution is odourless and perfectly limpid.

Guaiacol Syrup and Creosote Syrup. (*Rev. Med. Pharm.*, vi. 207, and *Zeitschr. des oesterr. Apoth. Ver.*, 1899, 972.) *Guaiacol Syrup.*—This is composed of 7·50 parts of crystallised guaiacol, 92·5 parts of glycerin, and 900 parts of simple syrup. The dose is a dessertspoonful five or six times a day with food.

Creosote Syrup.—This is prepared from 5 parts of beechwood creosote, 80 parts of glycerin, and 915 parts of simple syrup. A dessertspoonful is given five or six times a day with food.

Guaiamar. (*Nouv. Rem.*, xvi. 32. From *Brit. Med. Journ.*) This is a glycerin ester of guaiacol obtained by the action of anhydrous glycerin on guaiacol. It forms a white crystalline powder melting at 75° C.; its solubility in water is 1:20, and it is dissolved by most solvents. It is not hygroscopic, and has a bitter aromatic taste. It is given in doses of 20 centigrammes to 1 gramme. G. Butler has employed guaiamar in twenty cases of typhoid with the best results; it appears to act as an excellent intestinal antiseptic. It has also been applied to the joints, in cases of acute articular rheumatism, in the form of an ointment composed of guaiamar, 7 to 8 grammes, lanolin 30 grammes. In cases of gonorrhœal arthritis, guaiamar, combined with belladonna ointment, or with mercurial ointment, has been serviceable. Guaiamar has also given good results in pulmonary affections, and has the advantage of acting as a digestive tonic. In the form of lotions its antiseptic properties have been shown in the treatment of burns, ulcerations, and syphilitic sores. Internally it has also been beneficial in cystitis, chronic gonorrhœa, and all kinds of gastro-intestinal affections.

Guaiasanol. (*Pharm. Post*, xxxiii. 35, and *Pharm. Zeit.*) This name is given to the hydrochloride of diethyl-glycocoll-guaiacol, which is stated to possess deodorising, antiseptic and anæsthetic properties. It forms white prisms, melting at 184° C., has a

slight odour of guaiacol, and is readily soluble in water. Its solution is neutral to litmus paper. It is non-poisonous and non-corrosive and is readily absorbed; in the organism it liberates guaiacol. It is given in doses of 3 grammes in wafers three or four times a day. It may also be administered hypodermically. It is chiefly recommended for the treatment of tuberculosis.

Hæmoform. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 814.) This name is applied to an albumin preparation containing iron in organic combination, which is intended as a tonic and nutritive agent in chlorosis, anæmia and general debility.

Hedonal, a New Hypnotic. F. Goldmann. (*Pharm. Zeitung*, April 7th, 1900.) Hedonal is a new hypnotic consisting of the carbaminic ester of methylpropylcarbinol. The author has tried it extensively in cases of insomnia connected with neurasthenia and hysteria, and has found it to be a useful and harmless hypnotic. He has never observed any unpleasant secondary effects. Its administration does not appear to impair either respiration or blood pressure. In cases of great nervous excitement, it fails to produce sleep; but in ordinary cases where a mild hypnotic is all that is needed it gives very satisfactory results.

Homocresol. (From *Pharm. Zeitung.*) Homocresol is a new synonym for guaethol, which is also known as ajacol and thanatol, and consists of pyrocatechin-monoethyl-ether. It has been recommended as a substitute for guaiacol.

Honthin, a New Intestinal Astringent. (*Pharm. Post*, 1899, No. 46.) Honthin is introduced by A. v. Sztankay as a tannin compound of albumin, which is still more insoluble in gastric juice than tannalbin. It is given in doses of 0·5–1·5 gramme three or four times a day, suspended in some mucilaginous vehicle, such as decoction of salep.

Ibit. (*Pharm. Centralh.*, xli. 66; *Zeitschr. des oesterr. Apoth. Ver.*, 1900, 99.) The name ibit is given to an oxyiodotannate of bismuth, which resembles airol, and is introduced as a substitute for iodoform. It is used as a dusting powder, and for the impregnation of gauze. It has a faint acid reaction, and is insoluble in the usual solvents, but soluble in dilute acids and in caustic alkalies. It is gradually decomposed by contact with water, moist air, animal matter, or strong acids, iodine being liberated. It forms a good emulsion with glycerin and water and a stable ointment with fats or vaselin.

Ichthoform. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 38, and *Amer. Drugg. and Pharm. Rec.*, 1900, 8.) The preparation

introduced under this name is an odourless and tasteless combination of formaldehyde and ichthyol, which is recommended as a general antiseptic and particularly as an intestinal antiseptic. According to Eschle the preparation is non-toxic. It has been given in doses of 4 grammes per day in intestinal catarrh.

Igazol. V. Cervello. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 675.) Igazol is a trade name given by the author to a derivative of formaldehyde which is used in the treatment of tuberculosis. It is applied in the form of vapour for inhalations.

Kineurin. (*Merck's Report*, 1899, 49.) Kineurin is a trade name recently given to glycerophosphate of quinine. It is given in doses of ·3 to ·6 as an antiperiodic and antineuralgic, and in doses of 0·1 to 0·2 grammes as a tonic.

Lactarin. (*Pharm. Zeitung*, 1899, 629.) Lactarin is a trade name given by Wunderlich to a preparation consisting of pure casein.

Manganesia. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 974, from *Pharm. Centralhalle.*) The trade name manganesia has been applied to a solution containing potassium permanganate and potassium arseniate, which is proposed as a remedy for diabetes. According to A. Blomquist, it contains in 100 parts 8·7 parts of permanganate and 0·30 of $K H_2 As O_4$.

Mercuriol. *Brit. Med. Journ.*, Oct. 28, 1899; *Epit.*, No. 342.) This new mercury preparation is introduced for external medication in the treatment of syphilis. It is prepared by amalgamating mercury with aluminium and magnesium, and contains from 40 to 80 per cent. of metallic mercury in fine amorphous particles. When exposed to warmth, air, and humidity, the aluminium and magnesium are oxidised and the mercury is liberated. Ahman reports upon the treatment of 30 patients with this preparation, and expresses himself well satisfied with the result. It was applied by placing it in a woollen bag and wearing this next to the skin. Five grammes of mercuriol were used daily for the first five or ten days; afterwards every second day. The duration of treatment varied from 30 to 40 days.

Mercurol, Nargol, Cuprol, and Ferrinol. (From *Pharm. Centralhalle.*)

Mercurol is stated to be a compound of nuclein (obtained from pressed yeast) and mercury. It is soluble in water, yielding a neutral or slightly alkaline solution, and acts as an efficient germicide. It is free from caustic or irritant properties, and is

recommended for the local treatment of gonorrhœa, aural catarrh, corneal ulceration, and the ophthalmitis of newly-born infants.

Nargol is a nuclein compound of silver containing about 10 per cent. of the metal. It is a light brownish-white powder, readily soluble in warm water, with faintly alkaline reaction; it does not precipitate albumin and is not precipitated by alkalies or the ordinary reagents for silver. No precipitation takes place when solution of sodium chloride is added, but after long standing a gradual precipitation of silver chloride occurs.

Cuprol. This is a nuclein compound of copper containing about 6 per cent. of the metal. It is a green powder, which is readily soluble in warm water.

Ferrinol. This name is given to a nucleide of iron containing about 6 per cent. of the metal. It is a cinnamon-brown powder, yielding a neutral solution with warm water. The iron is present in it in a stable, organically combined condition.

All the foregoing compounds are stated to be preferable as therapeutic agents to the inorganic salts of the corresponding metals.

Mercury Phenol-p-Sulphonate in Combination with Ammonium Tartrate. (From *Pharm. Centralhalle.*) This preparation, introduced by Schaerges, is stated to have the composition $(C_{12}H_{10}O_8S_2Hg)\cdot 4[C_4H_4O_6(NH_4)_2] + 8H_2O$, and to be obtained by mixing a freshly prepared solution of mercury phenol-*p*-sulphonate with tartaric acid and solution of ammonia, and evaporating to dryness. The product is readily soluble in water, and is recommended as an antiseptic free from caustic action.

Metasol. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 675.) Metasol is merely a new and shorter name given by the Ichthyol Company to metacresol-anytol.

Monacetyl-Resorcin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899 551–552.) This preparation is obtained by treating resorcin at a slightly elevated temperature with acetic anhydride or with acetyl chloride. For application in dermatology, the product is stated to be preferable to resorcin or to the resorcin derivatives now in use, on account of its syrupy consistence. It melts at 283° C. and is soluble in alkalies.

Nectrianin. (*Rev. Méd.*, 1900, No. 295.) Nectrianin is a fluid preparation prepared by Bra and Mongour from *Nectria ditissima* for the cure of cancer (see article on *Nectria ditissima*, p. 143 in this volume). It is stated to be more of a local than a constitutional remedy, and to possess remarkable powers of alleviating

pain, which render it possible to dispense with the use of morphine in the treatment.

Nucleol. (From *Pharm. Zeitung.*) This preparation is stated to consist of pure nuclein in the form of a white powder readily soluble in warm water but insoluble in alcohol. It is prepared from yeast. The aqueous solution is capable of slowly dissolving mercuric oxide and other metallic oxides on the application of heat.

Nucleose. (*Münch. Med. Wochenschr.*, 1900, 242.) Nucleose is stated to be a preparation obtained from vegetable nucleo-albumins, and to contain, in addition to albumin, diastase, organically combined phosphorus, and a small proportion of mineral salts. According to Bovet it is well adapted as a nutritive and digestive stimulant, and is recommended in tuberculosis and other wasting diseases as well as in general debility. It splits up in the organism into albumin and nucleic acid. It is also said to possess diuretic properties and hence to promote the elimination of disease toxins.

Nural. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 38.) Nural is merely a new name for the food preparation hitherto known as "nutrol."

Oxaphor. (*Oest. Zeit. für Pharm.*, liii. 115. From *Pharm. Journ.*) This name is given to a 50 per cent. solution of oxycamphor in alcohol. Oxycamphor was formerly recommended as a remedy for dyspnœa, and is now introduced by Rumpel for respiratory troubles produced by organic heart complaints, constipation, emphysema, bronchitis, and consumption. It is given in a single dose, 0·5 to 1·0 gramme, or 1·5 to 2·0 grammes in twenty-four hours.

Petrolan. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 374.) The name petrolan is applied to a mixture of mineral oil and soap recommended by Frieser for skin diseases. It is stated to be free from the irritating effects produced by chrysarobin, pyrogallol, and the various tar preparations.

Plasmon. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 616; and *Zeitschr. Biol.*, 1900, 279.) This preparation is mainly composed of the proteids of milk, and also contains small quantities of the other milk constituents and sodium bicarbonate. It is obtained by precipitating the proteids from skimmed milk with diluted acetic acid, and neutralising with sodium bicarbonate. It is a pale yellow, odourless and tasteless powder soluble in a large quantity of water, and is stated not to become distasteful to patients even after prolonged use. Its properties have been investigated by H.

Poda and W. Prausnitz, who report that it is easily digestible and assimilable, and that its nutritive value is equal to that of meat.

Propolisin. (From *Pharm. Zeitung.*) This name is given to a disinfectant which is stated to be prepared by the dry distillation of beeswax. It is described as a reddish-brown slightly opalescent liquid.

Resaldol. (*Pharm. Zeitung*, 1900, 289, from *Therap. Monatsh.*, 1900, No. 4.) Resaldol is an acetyl derivative of a condensation product of chloromethylsalicyl-aldehyde and resorcin. It is an intestinal antiseptic in the form of a light amorphous yellow powder, insoluble in water and dilute acids, but soluble in alkaline liquids. It is relatively non-toxic and nearly tasteless. According to Herrmann it is well adapted for the treatment of catarrhal and ulcerated conditions of the intestinal mucous membrane, and is especially serviceable in intestinal tuberculosis. It is given in daily doses of 3–5 grammes.

Sapodermin. (*Pharm. Zeitung*, 1900, 240.) This name is given to a medicated soap prepared from mercury caseinate. The latter substance contains 6·9 per cent. of mercury, but in the soap it is so much diluted that the mercury only amounts to 0·2 per cent. A. Sack recommends sapodermin as a perfectly non-irritant disinfecting soap in dermatological practice, chiefly in parasitic skin diseases. It is said to act best when its lather is allowed to dry up on the skin.

Sicco. (*Pharm. Zeitung*, xlv. 87.) This name is given by Schneider to dry hæmatogen, which is described as a reddish-brown, odourless and tasteless crystalline substance, containing 89·52 per cent. of albumin, 0·11 per cent. of fat, 0·33 of iron in organic combination, 2·6 per cent. of mineral salts, and about 7 per cent. of moisture. It is completely soluble in cold water, yielding a solution which coagulates on heating. Liquid hæmatogen can be extemporaneously prepared from the dry preparation by dissolving 80 grammes of the latter in 400 of cold water, then adding to this a solution of 2 grammes of sodium hydrate in 270 grammes of water, and finally adding 120 grammes of alcohol, 120 grammes of simple syrup, and 5·5 grammes of *mixtura aromatica*. The preparation is allowed to stand for 3 days and is then filtered. Hæmatogen wine is obtained by dissolving 20 grammes of dry hæmatogen in 200 grammes of sherry. Hæmatogen pills are prepared by massing 30 grammes of dry hæmatogen with 5 grammes of powdered liquorice root, and making this into 200 pills.

Sidonal. (*Pharm. Zeitung*, and *Deutsch. Med. Zeitung.*) This name is given to a compound of piperazine and quinic acid, which is strongly recommended by Leyden as a remedy for the treatment of gout and uric acid diathesis generally, and also for rheumatism. It is given in doses of 5-8 grammes daily, and is stated not to impair the digestive functions.

Soson. (*Pharm. Centralhalle*, from *Münch. Med. Wochenschr.*, 1899.) This preparation is introduced as a substitute for meat and is described as a greyish-white, odourless and tasteless powder, containing 92·5 per cent. of albumin.

Sphagnol or Corbaol. (*Therap. der Gegenwart*, 1899, 469. From *Amer. Drugg. and Pharm. Rec.*) This preparation is stated to be a distillation product obtained from *Sphagnum* or peat moss, and to consist chiefly of benzol, anthracene, naphthol, phenol, cresol and cresylol. It has been recommended as a substitute for Peruvian balsam, tar, ichthyol, etc., in the treatment of chronic eczema. It is also recommended as a cooling and healing application for burns. Sphagnol is black in colour, of a disagreeable odour and ointment-like consistence. It melts at 37° C.

Spleniferrin. (*Pharm. Zeitung*, 1899, 907.) This preparation is stated to consist of the dried pulp of ox spleen with an admixture of ferrous albuminate. The iron amounts to 25-30 per cent., including the iron naturally contained in the spleen. The preparation is recommended for use in chlorosis, anæmia, etc. It occurs as a chocolate-brown powder, and is best administered in the form of pills.

Steresol and Adhesol. (*Formul. Bull. gén. de Thérap.* From *Pharm. Journ.*). Steresol is a varnish composed of 270 parts of shellac, 10 of benzoin, 10 of balsam of tolu, 100 of phenol, 6 of oil of cinnamon, 6 of saccharin, and sufficient 90 per cent. alcohol to produce 1000 fluid parts. It is used as an antiseptic dressing for the skin or the mucous membrane. Adhesol is less viscous, and contains alpha-naphthol in place of phenol. It is composed of 35 parts of copal resin, 3 of benzoin, 0·3 of alpha-naphthol, 3 of balsam of tolu, 2 of oil of thyme, and 100 of ether.

Sudol. (From *Pharm. Zeitung.*) This preparation is a mixture of lard, glycerin and a 3 per cent. solution of formaldehyde, and is perfumed with gaultheria oil. It has a cream-like consistence, and is recommended as an external application for checking excessive perspiration.

Tannocreosoform and Tannoguaiaform. (*Rep. de Pharm.*, 1899, 482.) Tannocreosoform and tannoguaiaform are odourless and

tasteless preparations produced by combining tannin and formaldehyde with creosote and guaiacol respectively. Both preparations have been recommended by Brissonnet as intestinal antiseptics and for the treatment of tuberculosis. It is also claimed that these preparations are of value in certain skin diseases.

Tenalgin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 155.) According to Crinon (*Revue des méd. nouv.*, 1900), this preparation is a mixture of the alkaloids of areca nut, and is introduced as a tænicide for dogs.

Toluidine Blue as an Ophthalmic Antiseptic. (From *L'Union Pharm.*) Toluidine blue is recommended by Veasey in cases of acute conjunctivitis, and is applied in the form of an aqueous solution containing 1 gramme per litre. It is also useful in the diagnosis of ulcerated conditions of the cornea, as it stains the affected particles blue, while leaving the healthy ones unstained.

Toluidine blue is a double chloride of zinc and dimethyl-tolu-thionine, and forms a black powder soluble with a fine blue colour in water and alcohol.

Triacetylpyrogallol. (From *Pharm. Zeitung.*) This new preparation is obtained by heating pyrogallol with acetic anhydride and sodium acetate. It is a snow-white substance, melting at 165° C., and is recommended for use in dermatology.

Veloril. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 973.) The name veloril is given to a substitute for caoutchouc and gutta percha, which is prepared from nitroricinolein and nitrocellulose.

Zinol. (*Pharm. Post*, xxix. 321.) This name is given to a combination of 1 part of zinc acetate and 4 parts of aluminium naphthol-sulphonate, prepared in the form of a powder or in tablets. It is recommended for gonorrhœa, its aqueous solution being applied as an injection.

Applications for Toothache. (*Pharm. Post*, xxix. 393.) (1) Oil of cajuput and oil of cloves, of each 1 part, chloroform 2 parts; (2) camphor 8, chloral hydrate 8, and spirit of peppermint 120 parts; (3) oil of cloves, tincture of Indian hemp and chloroform, equal parts; (4) oil of peppermint, alcohol, ether, and tincture of opium, of each equal parts; (5) menthol 8, ether 100, oil of cloves 60, and extract of aconite 4 parts; (6) oil of eucalyptus 4, mastic 8, camphor 45, morphine 5·5, chloroform 75, and alcohol, sufficient to produce 150 parts.

Pills for Toothache. (*Oest. Zeitschr. für Pharm.*, liii. 378.) (1) Spermaceti 1 part, chloral hydrate 2 parts, carbolic acid 1 part, cotton wool *q.s.* Melt the spermaceti and dissolve therein the

chloral and carbolic acid; saturate small pellets of wool with this and allow to cool. (2) Hard paraffin 98 parts, carbolic acid 2 parts. (3) Hard paraffin 12 parts, Burgundy pitch 14 parts, parsley oil 4 parts, creosote 4 parts. Divide these masses into small pieces, and place in the tooth. (4) Clove oil 1 part, cassia oil 1 part, black pepper 4 parts, sodium chloride 4 parts, gum acacia 4 parts. Mass into pills. (5) Salol 10 parts, liquid paraffin 10 parts, terebene 10 parts, beeswax 65 parts, alkannin *q.s.* Divide into pills.

Teething-Syrup. (*Chemist and Druggist*, lv. 244, from *L'Union Pharm.*)

Citric acid	8 gr.
Distilled water	10 minims.
Cocaine hydrochloride	1 gr.
Simple syrup	2 dr.
Syrup of saffron	2 dr.
Essence of vanilla	12 drops.

Mix.

To be rubbed on the gums of young infants when teething.

Bronchitis Capsules. G. F. Butler. (*Chemist and Druggist*, lv. 101. From *Med. Stand.*) The author recommends the following combination in chronic bronchitis, especially in relaxed conditions of the mucous membranes with excessive secretion:—

Olei terebinthinæ	♏xx.
Picis liquidæ	♏xx.
Olei eucalypti	♏l.
Balsami Tolutani	ʒiss.
Benzosol	ʒiv.

M. et disp. in caps. No. lx.

Sign. One four or five times a day.

Electuary for Habitual Constipation. (From *Apoth. Zeitung.*)

Sulphur precipitat.	10 grammes.
Potassii bitart.	10 „
Fol. sennæ pulv.	5 „
Cardamomi pulv.	0·15 gramme.
Syrup. Rhamni cathart. *q.s.*	

Fiat electuarium.

A teaspoonful to be taken night and morning.

Powder for Neuralgia. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 264.)

Quin. valerian	3 grs.
Pulv. ipecac. co.	3 „
Ferri carb. sacch.	6 „

M. Ft. pulv.

Remedy for Vomiting in Pregnancy. (From the *Lancet.*)

Potassii bromidi	℥ij.
Liquoris strychninæ	♏ss.
Aquæ chloroformi	ʒiij.
Aquæ ad.	ʒvi.

Half an ounce to be taken in water three times a day.

Treatment of Carbuncles. (*Therap. Gaz.*, xxii. 273.) A pad of eight layers of gauze, rather larger than the inflamed surface, is soaked in a solution composed of 30 grains of salicylic acid, 210 grains of boric acid, and 32 fluid ozs. of distilled water. This is covered with 10 per cent. ichthyol ointment, and held in place by a rubber protective, cotton wool, or a bandage. The dressing is left on for two days, when the cores will be found to have separated from their walls, and can be painlessly removed at the next dressing.

Removal of Ear Wax. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 39.) Ricci has recommended that a few drops of hydrogen peroxide be introduced into the outer ear, and preferably dropped directly upon the wax which is the source of trouble. After allowing this to remain in contact with the wax for a short time, the ear should be washed out with warm water.

Removal of Tattoo Marks. T. H. Whiting. (*Med. Brief.*, xxvii. 1803. From *Pharm. Journ.*) Salicylic acid massed with glycerin to the consistence of dough, applied over the marks with a compress and strips of adhesive plaster, and allowed to remain in contact for a week, will, according to the author, eventually remove tattoo marks. After the first dressing, the epidermis over the marks is removed, and a fresh application of the salicylic acid applied. Usually this second application removes the marks, but sometimes it is necessary to make a third.

Ointment for Acne Rosacea. (*Therap. Gaz.*, xxii. 238.)

Precipitated sulphur . .	60 to 240 grains.
Salicylic acid . . .	10 to 30 „
Oil of sweet almonds . . .	1 fl. drachm.
Lanolin	1 oz.

Mix carefully, so as to produce a perfectly smooth ointment. To be applied at bed-time after washing the affected parts.

Ointment for Eczema. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 264.)

Acid boric	drs. 3
Bals. Peruv.	grs. 20
Vaselini	ozs. 2
Oil bergam.	*q.s.*

Ointment for Lupus. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 383, from *Deutsch. Monatschr. für prakt. Dermat.*) Unna recommends the following:—

Salicylic acid	1 part.
Butter of antimony	1 „
Creosote	2 parts.
Extract of Indian hemp	2 „
Lanolin	4 „

Ointment for Gonorrhœa. (*Pharm. Journ.*, from *Formul. Bull. gén de Thérap.*) Cacao butter, 100 parts; yellow wax, 2 to 6; silver nitrate, 5; balsam of Peru, 2 parts; mix. To be used on a metal sound; four applications are often sufficient to effect a cure.

Ointment for Piles. (*Pharm. Post*, xxxii. 721.) Lanolin, 120 parts; petrolatum, 75; glycerin, 45; extract of hamamelis, 30; tannic acid, 4; tincture of opium, 4 parts.

Ointment for Measles. (*Chemist and Druggist*, lvi. 359.) Good results are stated to have been obtained with an ointment of the following composition:—Ichthyol, 460 grains; lard, 3 ounces. This is applied night and morning for four or five days, followed after recovery by a warm bath.

Copper Ointments for Glandular Enlargements. (*Therap. Gazz.*, [3], xvi. 31. From *Pharm. Journ.*) Some time ago Hoppe recommended the application of cupric oxide ointment for enlarged glands of the neck. The ointment was composed of 1 part of black oxide of copper, and 8 parts of lard. Mosler employs the following:—Cupric oxide, 2 parts; vaselin, 14 parts. This is applied with friction until it causes papular eruption, which, if caution be not used, may go on to actual ulceration of the skin. Luton has used the following application for scrofulous glands:—Neutral cupric acetate, 15 grains; vaselin, 1 to 3 ounces.

Chilblain Remedies. (*Pharm. Post*, xxxii. 721. From *Pharm. Journ.*) Thibridge recommends the following preparations:—(*a*) Zinc oxide, 150 parts; carbolic acid, 8; vaselin, 225; lanolin, 230 parts. (*b*) The same ingredients and proportions, except that the phenol is replaced by menthol, 4·5 parts. For deeper inflammation the following is recommended:—(*c*) Lead subacetate, 30 parts; carbolic acid, 7; zinc oxide, 225; vaselin, 225; lanolin, 225 parts; or, (*d*) Lead subacetate, 3 parts; bismuth subnitrate, 9; Rousseau's laudanum, 1·5; vaselin, lanolin, and lard, of each, 15 parts.

Local Applications for Rheumatism. (*Practitioner*, lxiii. 358. From *Pharm. Journ.*) The following application is recommended by Bourget:—Salicylic acid, 45 grains; oil of turpentine, 45 minims; wool fat, 5 drachms; lard, 5 drachms. This is spread over the parts, a dressing of absorbent cotton applied, then covered with any impervious material. S. Sterling employs the following ointment:—Salicylic acid, oil of turpentine, lanolin, of each, 1 part; lard, 4 parts. This is applied to the affected joint, covered with non-absorbent cotton, then wrapped in gutta percha. When the superficial epidermis is destroyed, the turpentine is omitted.

Sulphur Paste for Acne. (*Rev. Med. Pharm.*, vi. 74.)

Sublimed sulphur Alcohol (90 per cent.) Water	of each—20 grammes.
Mucilage of acacia	6 grammes.

To be applied night and morning to the affected parts.

Mixtures of sublimed sulphur and boric acid in various proportions may be used instead of the sulphur only, if, when made with the latter, the paste should cause irritation.

Applications for Removing Wrinkles. (*Practitioner*, lxiii. 117.)

1.

Sweet oil of almonds	2 drachms.
Cacao butter	4 „
Lanolin	2 ounces.

Melt these together and then add—

Glycerin	2 drachms.
Otto of rose	2 drops.

To be applied at bed-time.

2.

Glycerol of tannin Rosewater	equal parts.

To be applied to the wrinkled surface with a camel-hair brush.

Face Wash. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 102.)

Borax	1 drachm.
Solution of carmine	*q.s.*
Glycerin	4 drachms
Spirit of rosemary	3 „
Rose water, enough to make	6 ozs.

Mix, and filter.

Rose Milk. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 68.)

Olive oil	2¼ ozs.
Soap	2¼ „
Wax	2¼ „
Spermaceti	2¼ „
Sweet almonds	4 lbs.
Oil of rose	150 grs.
Rose water	4 pints.
Alcohol	1 pint.

Almond Cream. (*Pharm. Journ.*, 4th series, x. 274.) 120 grammes of sweet almonds are rubbed into a perfectly smooth paste with 480 grammes of water, and mixed with a previously-melted mixture of 7·5 grammes of white wax, 7·5 of white Castile soap, and 15 grammes of spermaceti; finally, 16 drops of oil of rose, dissolved in 180 c.c. of 90 per cent. alcohol, are added.

Lanolin Creams. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 387.) (1) 640 grammes of lanolin and 220 grammes of white vaselin are melted together, then mixed with a solution of 5 grammes of borax in 135 grammes of water, and the mixture is perfumed with 1 gramme of otto of rose and 2 grammes of oil of bergamot.

(2) 200 grammes of spermaceti and 600 of yellow vaselin are melted together, and then intimately mixed with 800 grammes of wool fat and a sufficient quantity of water to produce a cream of suitable consistence, which is finally perfumed with 5 grammes of oil of lemon.

Boroglyceride Lanolin. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 388.) 350 grammes of wool fat are melted with 130 of olive oil, and a warm solution of 20 grammes of boric acid in 50 of water and 100 of glycerin is slowly and thoroughly incorporated with the mixture, which is then kept briskly stirred until it is cold.

Application for Whitening the Hands. (*Deutsch. Am. Apoth. Zeit.*, xix. 157.)

Lanolin	30 parts.
Glycerin	20 „
Borax	10 „
Eucalyptol	2 „
Essential oil of almonds	1 part.

The mixture is rubbed on the hands, which are then covered with gloves for the night.

Cosmetiques. (*Chemist and Druggist*, lv. 703.)

—	A.	B.	C.
Resin	25 ozs.	25 ozs.	30 ozs.
Suet	20 „	10 „	10 „
Vaselin oil	—	35 „	40 „
Ceresin	7 ozs.	40 „	50 „
Palm oil	—	10 „	10 „
Castor oil	2½ ozs.	—	—
Oil of bergamot	—	1½ drs.	1 oz.
Oil of cloves	3½ drs.	—	—
Oil of lemon	—	1 oz.	3½ drs.
Oil of cassia	3½ drs.	2½ drs.	3½ „
Oil of lavender	3 „	—	—
Oil of anise	—	1½ drs.	—

Melt the solids and fixed oils together, strain, add the perfumes, and mould into sticks or cakes.

Hair Wash for Premature Baldness. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 383.) According to a communication by Gessner in *Rev. de Thérap.*, the following preparation has proved efficient in premature baldness:—Resorcin, 2·5 grammes; chloral hydrate and tannic acid, of each 5 grammes; tincture of benzoin, 1 gramme; castor oil, 4 grammes; rectified spirit sufficient to make 250 grammes.

Eau de Botot. (*Pharm. Zeitung*, 1900, 153.)

Aniseed	20 parts.
Cloves	20 „
Cassia bark	20 „
Oil of peppermint	10 „
Cochineal	5 „
Vanilla	1 part.
Alcohol (70 per cent.)	800 parts.
Rose water	200 „
Tincture of ambergris	10 „

Florida Water. (*Pharm. Post*, xxxii. 721.) Oil of lavender, 7·5 grammes; oil of lemon, 7·5; oil of bergamot, 7·5; oil of neroli, 3·75; oil of clove, 3·75; oil of melissa, 1·8 grammes; and otto of roses, 6 drops, are dissolved in 880 grammes of 90 per cent. alcohol. The solution is allowed to stand for some time, then mixed with 180 grammes of water, and filtered through magnesia.

Formulæ for Tooth Powders. (*Chemist and Druggist*, lv. 361.)

Pink Rose-flavoured Tooth Powder.

Precipitated chalk	1 lb.
Powdered orris-root	2 ozs.
Sugar	1½ „
White Castile soap	1 oz.
Carmine	15 grs.
Oil of rose	12 ♏.
Oil of cloves	4 ♏.

Violet Tooth Powder.

Precipitated chalk	1 lb.
Powdered orris-root	4 ozs.
Castile soap	1 oz.
Sugar	1½ „
Extract of violet	¼ „

Green colouring.

Antiseptic Tooth Powder.

Precipitated chalk	1 lb.
Castile soap	5 drs.
Borax	3 „
Thymol	20 grs.
Menthol	20 „
Eucalyptol	20 „
Oil of wintergreen	20 „
Alcohol	½ oz.

Dissolve the thymol and oils in the alcohol, and triturate with the chalk.

Carbolic Tooth Powders. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 203.)

I.

Precipitated chalk	4 ozs.
Powdered white Castile soap	¼ oz.
Powdered cuttlefish	½ „
Pure carbolic acid	½ dr.
Oil of cloves	4 min.

II.

Pulv. sapon. alb.	1 oz.
Cretæ præcipitat.	8 ozs.
Acid. carbolic.	1 dr.
Ol. eucalypti	½ „

III.

Terra alba (fine sifted)	8 ozs.
Orris powder	1½ „
Powdered white soap	½ oz.
Carbolic acid	½ dr.
Camphor	½ „
Otto of rose	10 min.
Solution of carmine	a sufficiency.

IV.

Pulv. myrrhæ	1 oz.
Terræ rosæ	½ „
Acid. carbol.	½ dr.
Pulv. sapon. castil.	½ oz.
Otto rosæ	15 min.
Ol. caryoph.	½ dr.
Cretæ præcip.	16 ozs.

V.

Silicæ præcipitat	7 ozs.
Pulv. sapon. alb.	½ „
Acid. carbolic.	20 grs.
Camphor	20 grs.
Ol. gaultheriæ	3 min.

VI.

Acid. carbolic.	2 drs.
Pulv. iridis	½ oz.
Pulv. oss. sepiæ	½ „
Infusorial earth	6 ozs.
Ol. gaultheriæ	10 min.
Ol. menthæ pip.	4 „
Carmini	3 gr.

Tooth Powder and Mouth Wash for Children. (*Chemist and Druggist*, lv. 34.) Monti's formulæ are given as follows in the *Dental Review*:—

Magnesium carbonate	75 grs.
White chalk	225 „
Sodium salicylate	225 „
Oil of peppermint	6 drops.

Mix.

Boric acid	3 parts.
Distilled water	200 „
Tincture of myrrh	2 „

Mix.

Mouth Wash for Catarrhal Throat of Smokers. (*Zeitschr. des oesterr. Apoth. Ver.*, 1900, 383.)

Salol	1 gramme.
Spirit of peppermint	50 grammes.
Tincture of catechu	2 „

A teaspoonful to be taken in a tumblerful of warm water.

Astringent Mouth Wash. (*Amer. Drugg. and Pharm. Rec.*, xxxvi. 203.)

Acid boric	4 drs.
Tincture krameriæ	1 oz.
Tincture myrrh	2 ozs.
Eau de Cologne or alcohol	20 ozs.

Antiseptic Mouth Pellets. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 473, from *Pharm. Centralhalle.*) Pellets in the form of cachous are prepared, each of which contains 1 milligramme of thymol, menthol, eucalyptol, saccharin and vanillin. They are intended to be used in catarrhal conditions in place of tooth or mouth washes and gargles, especially in the case of children not old enough to use a gargle. According to the age of the patient, one or two of these pellets are allowed to slowly dissolve in the mouth, the solution being swallowed.

Antiseptic Sticking Plaster. (*Zeitschr. des oesterr. Apoth. Ver.*, 1899, 473, from *Pharm. Rundschau.*) Koller recommends a plaster prepared by mixing 1 gramme of salicylic acid with 45 grammes of gum arabic, 55 grammes of water, and 2 to 3 grammes of glycerin, spreading this mixture by means of a brush on sheets of paper fastened down to a board, and then allowing to dry.

Waterproof Paper. (*L'Union Pharm.*, from *Rev. Chem. Ind.*) Paper may be rendered waterproof by wetting it on both sides with a solution of 1 part of gelatin and 1 part of glycerin in 4 parts of water. After drying, the paper is immersed in a 10 per cent. solution of formalin, and is then again dried.

Fireproof Paper. (From *Pharm. Zeitung.*) Paper may be rendered non-inflammable by wetting it with a solution of 8 parts of ammonium sulphate, 3 of boric acid, and 2 of borax in 100 parts of water, and then allowing to dry. A solution of sodium tungstate may be used for the same purpose.

Fumigating Pastilles for Insects. (From *Apoth. Zeitung.*) 4 parts of carbolic acid, 6 of potassium nitrate, 25 of Persian or Dalmatian insect powder, 50 of wood charcoal, and 9·3 of tragacanth

are worked into a mass with water and made into pastilles. Another suitable mass may be obtained from 100 parts of benzoin, 100 of tolu balsam, 500 of wood charcoal, 150 of insect powder, 50 of potassium nitrate, and a sufficient quantity of water.

Formaldehyde for the Preservation of Meat. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 165.) Schering has introduced a process for the preservation of meat, which consists in exposing the meat to the action of gaseous formaldehyde in a confined space until thorough sterilization has been effected, and then replacing the gas by sterilized air. It is claimed that the process does not affect the appearance, the taste or the nutritive value of the meat so treated.

Russet Leather Shoe Polish. (*Amer. Drugg. and Pharm. Rec.*, xxxv. 5.)

I.

Yellow beeswax	2 ozs.
Linseed oil	3 ozs.
Oil of turpentine	10 ozs.

Dissolve by means of a water-bath in a closed vessel and add—

Hard yellow soap, finely shaved	1¼ ozs.

Dissolve the soap with the aid of heat in 14 ozs. of water and add the solution to the solution of yellow wax and linseed oil formed in the first instance. A nice russet brown colour may be imparted to this shoe polish by incorporating about 3 grains of Bismarck brown to each ounce of the polish.

II.

Oil of turpentine	10 ozs.
Yellow wax	5 „
Soap	½ oz.
Boiling water	10 ozs.

Dissolve the wax in the turpentine by the aid of a water-bath, and the soap in the boiling water. Mix and stir until cold and smooth.

III.

Soft soap	1 oz.
Linseed oil, raw	1½ ozs.
Annatto	4 ozs.
Yellow wax	1½ ozs.
Gum turpentine	4 ozs.
Water	4 ozs.

Dissolve the soap in the water and add the annatto. Melt the

wax in the linseed oil and turpentine, and gradually add the soap solution, stirring until cold.

Deep Black Shoe Polish. (*Pharm. Zeitung*, 1900, 153.) W. K. Penzlin recommends the following:—100 parts of ivory black are intimately mixed with 5 parts of olive oil and 50 parts of glycerin, and subsequently with 10 parts of vinegar, until a thoroughly uniform mixture is obtained. This polish imparts to the leather a fine gloss, and keeps it in a soft flexible condition.

Carbon Tetrachloride as a Paint or Varnish Diluent. G. A. Le Roy. (*Journ. Soc. Chem. Ind.*, xix. 359.) The author recommends the use of the chlorides of carbon, and particularly of carbon tetrachloride, as the solvent in a spirit varnish, or the diluent in a paint or oil varnish. The chlorides may be employed by themselves or mixed with a certain proportion of any of the usual liquids. The advantages claimed are, diminished inflammability, less tendency for the pigment to deposit on keeping (owing to the high specific gravity of the chlorides), freedom from solidification or resinification during storage, very brilliant strong films, and excellent drying power.

Regeneration of Caoutchouc. M. Zingler. (*Journ. Soc. Chem. Ind.*, xviii. 844.) The oxidised or "perished" caoutchouc is washed, rolled out into thin sheets, and immersed for several days in one of the following solutions, the proportions given being per 100 parts of caoutchouc:—

(1) Water, 300–400 parts; tartar emetic, 2·5 parts; tannic acid, about 7·5 parts; sodium sulphite, 2·5 parts. The tannic acid may be replaced by catechu, bark extract, etc., in suitable proportions.

(2) The same solution, except that the tartar emetic is replaced by about 5 parts of calcium sulphite or other metallic sulphites.

(3) Solution No. 1 + 2·5 parts of calcium (or other) sulphite.

On removal from the bath, the caoutchouc is dried in a current of air or by means of a hydro-extractor, and will be found to have become non-absorbent towards moisture, its solidity and resistance to extension being also improved by the treatment.

Corks impregnated with Caoutchouc. (*Pharm. Centralh.*, xl. 406. From *Pharm. Journ.*) Corks are immersed in a solution of 1 part of caoutchouc in 19 parts of benzol, and then dried in a vacuum and freed from odour by exposure to air.

Grafting Wax. T. Tidmarsh. (*Gard. Chronicle*, [3], xxvi. 420.) 3 parts of resin and 1 part of beeswax are melted together.

For use this is remelted in a glue-pot, the water-jacket of which will retain it in a workable consistence for a considerable time, and, at the same time, prevent it from being overheated to a point dangerous to the scions. For hot climates the proportion of resin should be increased to 4 to 1 of wax.

Gripping Lubricant for Driving Belts. (*Pharm. Centralh.*, xl. 449. From *Pharm. Journ.*) One part of caoutchouc minutely divided is heated to 60° C., with 1 part of rectified turpentine oil; when dissolved, 1 part of ceresin is added and also melted. In another vessel 2 parts of tallow and 5 parts of train oil are melted together, and both portions are well mixed.

Deodorised Petroleum. (*L'Union Pharm.*, xl. 413.) According to the *Revue Scientifique*, petroleum may be almost entirely deprived of its odour in the following manner :—4½ litres of petroleum are strongly shaken with 100 grammes of chlorinated lime and a small quantity of hydrochloric acid, until the chlorine thus produced has thoroughly penetrated the liquid. The latter is now transferred to another bottle containing quicklime until the chlorine is completely absorbed. The mixture is then allowed to stand for some time, and the petroleum decanted.

Petroleum Insecticide. (*L'Union Pharm.*, xl. 412.) Ordinary soft soap is mixed with an equal weight of warm water and with the same weight of paraffin oil, the latter being added slowly and with constant stirring so as to obtain a perfectly homogeneous emulsion. Before use, this emulsion should be diluted with about 50 times its volume of water.

TRANSACTIONS

OF THE

British Pharmaceutical Conference

AT THE

THIRTY-SEVENTH ANNUAL MEETING

IN

LONDON,

1900.

CONTENTS.

Constitution and Rules of the Conference.

Alphabetical List of Members' Names and Addresses.

Programme of Transactions of the Conference in London, 1900, including Titles of Papers.

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General Index to the Year-Book and Transactions.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following :—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.
2. The subscription shall be 7*s.* 6*d.* annually, which shall be due in advance upon July 1.
3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.
4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.
5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.
6. At each Conference it shall be determined at what place and time to hold that of the next year.
7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.
8. The Executive Committee shall present a report of proceedings annually.
9. These rules shall not be altered except at an annual meeting of the members.
10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*** *Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

FORM OF NOMINATION.

I Nominate

(*Name*) .....

(*Address*) .....

as a Member of the British Pharmaceutical Conference.

..... *Member.*

Date .....

This or any similar form must be filled up legibly, and forwarded to *The Asst. Secretary, Brit. Pharm. Conf.*, 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

HONORARY MEMBERS.

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Stewart, J., 44, George Street, Limerick.
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Stiles, M. H., F.R.M.S., 2, French Gate, Doncaster.
Stockdale, R., Blundellsands, Liverpool.
Stockman, Prof. R., M.D., F.R.C.P.E., The University, Glasgow.
Stoker, G. N., F.I.C., F.R.M.S., Government Laboratory, Clement's Inn Passage, W.C.
Stones, W., 7, Ardwick Green North, Manchester.
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Stratton, W. G., 61, Rosemount Gardens, Belfast.
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Sturton, R., Park Terrace, Cambridge.
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Sunner, R., Patrick Street, Cork.
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Sutcliffe, I., 17, High Street, Buxton.
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Swire, J., King Cross, Halifax.
Symes, Dr. C., Ph.C., F.C.S., 14, Hardman Street, Liverpool.

Tamplin, E. C., Kingston-on-Thames.
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Tate, James, Royal Avenue, Belfast.
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Thomas, H., 143, High Street, Merthyr.
Thompson, C., 159, Stratford Road, Sparkbrook, Birmingham.
Thompson, C. J. S., Rose Lane, Moseley Hill, Liverpool.
Thompson, H., 101, Southwark Street, S.E.
Thompson, H. A., 40, Aldersgate Street, E.C.
Thomson, Isaac W., 19, Bellevue Crescent, Edinburgh.
Thomson, W., 9, Rokeby Terrace, Hillhead, Glasgow.
Thomson, W., F.I.C., F.R.S.E., Royal Institution Laboratory, Manchester.
Thomson, W., 104, Byres Road, Glasgow.
Thorp, J., 66, Heaton Moor Road, Heaton Chapel, near Stockport.
Thorp, W. T., 97, Yorkshire Street, Oldham.
Thresh, John C., M.D., D.Sc., D.P.H., Chelmsford, Essex.

Tichborne, Prof. C. R. C., Ph.D., F.I.C., F.C.S., etc., 15, North Great Georges Street, Dublin.
Tickle, T., Herbert Villa, East Lane, Wembley, Middlesex.
Tilsley, J., Berriew, Montgomeryshire.
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Tirrell, J., Market Square, Hanley.
Tocher, J. F., F.I.C., F.C.S., 5, Chapel Street, Peterhead, N.B.
Tollitt, W., 89, Montague Street, Worthing.
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Toone, Arthur H., 17, Rolle Street, Exmouth.
Toone, J. A., 50, Old Christchurch Road, Bournemouth.
Townsend, C., M.P., J.P., 7, Union Street, Bristol.
Townsend, Wm., Little Queen Street, Exeter.
Troke, C., 2, Bath Street, City Road, E.C.
Troughton, Chas. A. J., 1, Ardlee Terrace, Holywood, Co. Down.
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Tull, F. C., 135, Peascod Street, Windsor, Berks.
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Tupman, H. Wyke, 6, Montague Street, Worthing.
Turnbull, H. J., Tavistock Works, Sunderland.
Turner, C. W., Foregate, Worcester.
Turner, G. T., Whiteladies' Gate, Clifton, Bristol.
Turner, J. Scriven, 20, Bury Street, Great Russell Street, W.C.
Turner, J. W. J., 118, The Moor, Sheffield.
Turney, J. Davy, 15, Leigham Terrace, Plymouth.
Twiss, W., Hunstanton, Norfolk.
Tyrer, Chas., F.C.S., Stirling Chemical Works, Abbey Lane, Stratford, E.
Tyrer, Thos., F.I.C., F.C.S., Stirling Chemical Works, Abbey Lane, Stratford, E.
Tyson, John, Victoria Bridge, Manchester.

Umney, C., F.I.C., F.C.S., 48 & 50, Southwark Street, S.E.
Umney, E. A., 48 & 50, Southwark Street, S.E.
Umney, John C., F.C.S., 48 & 50, Southwark Street, S.E.
Unsworth, J. W., 113, George Street, Altrincham, Manchester.

Vallance, A. C., Fieldhead, Mansfield.
Vallet, C. E. Franklin, 1, Victoria Villas, High Rd., Gunnersbury, W.
Vincent, P., 19, Jerdan Place, Fulham, S.W.
Voce, W. G., 52, Halesowen Road, Netherton, near Dudley.
Vogt, Geo., 30, Highgate, Kendal.

Wakeham, C., Helston, Cornwall.
Walker, Frank, 12, Beacon Lane, Everton, Liverpool.
Walker, J., Grange Road, West Kirby.
Walker, James D., 5, Alvanley Terrace, Bruntsfield Links, Edinburgh.
Walker, John, 32, Virginia Street, Glasgow.
Walker, J. F., M.A., F.I.C., F.C.S., 45, Bootham, York.
Walmsley, G., 8, Surbiton Park Terrace, Kingston-on-Thames.
Walmsley, M., 225, Oxford Street, W.
Walsh, Dr. J. A., 30, Westmorland Street, Dublin.
Walton, R., 73, High Street, Maidenhead.
Wand, S., 18, Haymarket, Leicester.
Want, W. P., 42, Bishopsgate Street Without, E.C.
Ward, G., F.I.C., F.C.S., Millgarth Mills, Leeds.
Ward, J., 39, Eastgate Street, Gloucester.
Ward, J. S., 101, Whitecross Street, E.C.
Ward, W., F.C.S., Sheffield Moor, Sheffield.
Wardleworth, Theo. H., 56, Hanover Street, Liverpool.

Waring, A. W., 3, Bucklersbury, E.C.
Warren, W., 24, Russell Street, Covent Garden, W.C.
Warrick, F. W., 7, Portpool Lane, E.C.
Wathes, A., 6, Holloway Head, Birmingham.
Watkinson, J. W., 43, Higher Market Street, Farnworth, Bolton.
Watson, A. J., 41, Mill Lane, West Hampstead, N.W.
Watson, David, 558, Cathcart Road, Govanhill, Glasgow.
Watson, F. P., F.C.S., 6, Bailgate, Lincoln.
Watson, J. E. H., Rose Corner, Norwich.
Watson, John, Rosemount, Knock, Belfast.
Watson, T. D., F.C.S., 16, St. Mary's Road, Bayswater, W.
Watt, Geo. A., 20, Lynn Street, West Hartlepool.
Watts, J., 365, Tong Street, Dudley Hill, Bradford, Yorks.
Weary, C. T., 17, Trafalgar Place, Devenport.
Weaver, A. C., 42, Dudley Road, Wolverhampton.
Webb, Chas. S., 87, North Side, Clapham Common, S.W.
Webb, E. A., Cookham Dene, Chislehurst, Kent.
Webb, J. H., Rowsley House, Cardiff Road, Luton, Beds.
Weddell, George, 20, West Grainger Street, Newcastle-on-Tyne.
Weld, C. Corning, Snow Hill Buildings, Holborn Viaduct, E.C.
Wellburn, John S., 60, Nightingale Road, Lower Clapton, E.
Wellcome, H. S., Snow Hill Buildings, Holborn Viaduct, E.C.
Wellings, Wm., 56, Hanover Street, Liverpool.
Wells, W. F., junr., 20, Upper Baggot Street, Dublin.
Welton, Henry, junr., Bishop Street, Coventry.
West, G. W., Market Place, Stokesley, R.S.O.
West, T., 1187, Chester Road, Stretford, Manchester.
Weston, S. J., 151, Westbourne Terrace, W.
Whigham, R. L., 22, Brook Street, Bond Street, W.
White, Arthur F., 61, Sunbridge Road, Bradford, Yorks.
White, E., B.Sc., F.I.C., St. Thomas's Hospital, London, S.W.
White, G., 55, High Street, Dudley.
Whitfield, J., F.C.S., 113, Westborough, Scarborough.
Whittle, J., Bridge Street, Morpeth.
Whyte, J. S., 57, Guthrie Port, Arbroath, N.B.
Wiggins, H., 236, Southwark Park Road, S.E.
Wigginton, A., 137, Sloane Street, S.W.
Wild, John, 307, Oxford Street, Manchester.
Wild, Sydney, Springfield House, New Mills, Derbyshire.
Wild, T. J., 204, Peckham Rye, S.E.
Wilford, J., 52, Milton Street, Nottingham.
Wilkinson, B. J., 7, Middleton Road, Kingsland, N.E.
Wilkinson, G., 267, Waterloo Road, Manchester.
Will, W. Watson, F.C.S., 1, St. Agnes Place, Kennington Park, S.E.
Willan, R., 5, Market Street, Ulverston.
Williams, J. H., 35, Commercial Road, Bournemouth.
Williams, W. G., 8, Castle Street, Conway.
Williams, W. Jesse, Park Hall Buildings, Queen Street, Cardiff.
Williamson, F. A., 17, Lovat Road. Preston, Lancs.
Williamson, L., Haldane Terrace, Newcastle-on-Tyne.
Williamson, W. H., 72, Elizabeth Street, Cheetham, Manchester.
Wills, G. S. V., Westminster College, Trinity Square, Boro', S.E.
Wilson, A., Phœnix Mills, Dartford, Kent.
Wilson, H., F.I.C., 146, High Street, Southampton.
Wilson, Harold, University College Hospital, Gower Street, W.C.
Wilson, J., 11, George Street, Bath.
Wilson, J. H., J.P., The Knowle, Harrogate.
Wilson, T., Stowmarket, Suffolk.
Wing, G. N., 29, Market Place, Melton Mowbray.
Wink, J. A., 2, Devonshire Square, Bishopsgate Street, E.C.

Wokes, T. S., Grassendale, near Liverpool.
Wood, A., New Brentford, Middlesex.
Wood, Wm., 24, Tower Road, Dartford, Kent.
Wooddisse, Frank B., Kenilworth.
Woodhead, S. A., The College, Uckfield, Sussex.
Woods, W. H., 50, Bedford Street, Plymouth.
Woodward, M. Mellor, 53, London Road, Reigate.
Woollcombe, R. L., LL.D., F.I.Inst., F.S.S., M.R.I.A., 14, Waterloo Road, Dublin.
Woolley, E. J., Victoria Bridge, Manchester.
Woolley, G. J. B., London Road, Leicester.
Woolley, G. S., Victoria Bridge, Manchester.
Woolley, Hermann, Victoria Bridge, Manchester.
Woolley, S. W., 91, Southwood Lane, Highgate, N.
Woollons, C. H. F., 28, Kilburn Lane, W.
Wootton, A. C., Barrymore, Fallow Corner, North Finchley, N.
Wootton, H., B.Sc., 323, Clapham Road, S.W.
Worfolk, G. W., 16, Brook Street, Ilkley.
Worrall, J. H., F.I.C., F.C.S., Howsley, Chapeltown, nr. Sheffield.
Worsley, A. G., 135, Ladbroke Grove, W.
Wrenn, W. A., F.C.S., 15, East Street, Taunton.
Wright, A., A.K.C., 13, High Street, Yeovil, Somerset.
Wright, G., 102, High Street, Burton-on-Trent.
Wright, H. C., 48 & 50, Southwark Street, S.E.
Wright, R., F.C.S., 11, Eagle Parade, Buxton, Derbyshire.
Wyatt, H., 223, Stanley Road, Bootle, Liverpool.
Wyborn, J. M., F.C.S., 59, Moorgate Street, E.C.
Wyley, W. F., Wheatley Street, Coventry.
Wyman, J. S., 58, Bunhill Row, E.C.
Wynne, E. P., 7, Pier Street, Aberystwith.

Yates, C. G., 9, Upper Hamilton Road, Brighton.
Yates, D., 32, Darwen Street, Blackburn.
Yates, F., "Aysgark," Avenue Elmers, Surbiton.
Yates, R., "Gatewick," The Avenue, Beckenham, Kent.
Young, J. Rymer, F.C.S., 40, Sankey Street, Warrington.
Young, J. R., 35, Chalmers Street, Lauriston, Edinburgh.
Young, J. R., junr., 2, Grange Road, Edinburgh.
Young, Pelham C., 229, High Road, Kilburn, N.W.
Young, R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows:—

THE ASST. SECRETARY,
BRIT. PHARM. CONF.,
17, *Bloomsbury Square,*
London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.
The North British Branch of the Pharmaceutical Society of Great Britain.
The Pharmaceutical Society of Ireland.

ABERDEEN.—Pharmaceutical Association. John Cruickshank, 42, George Street, Aberdeen.

BELFAST.—Chemists and Druggists' Society of Ireland (North Branch). W. J. Rankin, 10, Garfield Chambers, Belfast.

BIRMINGHAM.—Midland Pharmaceutical Association. G. H. Brunt, Coventry Road, Birmingham.

BOURNEMOUTH.—Chemists' Association. Stewart Hardwick, 21, Commercial Road, Bournemouth.

BRIGHTON.—Association of Pharmacy (1861). W. W. Savage, 109, St. James's Street, Brighton.

BRISTOL.—Pharmaceutical Association (re-established 1869). B. Keen, 90, Park Street, Bristol.

CAMBRIDGE.—Pharmaceutical Association. B. S. Campkin, Mill Road, Cambridge.

COLCHESTER.—Association of Chemists and Druggists (1845). Edes Everett, St. Botolph Pharmacy, Colchester.

DOVER.—Chemists' Association. R. M. Ewell, 37, Town Wall Street, Dover.

EDINBURGH.—Chemists' Assistants and Apprentices' Association. John Geo. Sclater, 3, St. Andrew Square, Edinburgh.

FORFARSHIRE AND DISTRICT.—Chemists' Association. Wm. Cummings, 49, Reform Street, Dundee.

GLASGOW AND WEST OF SCOTLAND.—Pharmaceutical Association. D. Watson, 558, Cathcart Road.

HASTINGS.—Chemists' Association (1884). A. N. Beck, 2, Cambridge Gardens, Hastings.

HULL.—Chemists' Association (1868). C. B. Bell, 6, Spring Bank, Hull.

LANCASHIRE (NORTH-EAST).—Chemists' Association.

LEEDS.—Chemists' Association (1862). W. D. Pollitt, Church Institute, or 106, Woodhouse Lane, Leeds.

LIVERPOOL.—Chemists' Association (1849). Theo. H. Wardleworth, 56, Hanover Street, and Hugh O. Dutton, Rockferry, Liverpool.

LONDON.—Chemists Assistants' Association. A. Latreille, 48, Baker Street, W. Western Chemists' Association. H. Cracknell, 17, Craven Road, W.; and W. Philp, 34, High Street, Notting Hill, W.

MANCHESTER.—Pharmaceutical Association. J. W. Walton, 427, Higher Broughton.

NEWCASTLE-ON-TYNE.—Newcastle-on-Tyne and District Chemists' Association. F. Gilderdale, 19, Groat Market, Newcastle-on-Tyne.

NOTTINGHAM.—Nottingham and Notts Chemists' Association (1863). A. Eberlin, 2, Chapel Bar, Nottingham.

OLDHAM.—Chemists' and Druggists' Assistants and Apprentices' Association (1870). C. G. Wood, Church Institute, Oldham.

OXFORD AND DISTRICT.—Chemists' Association. John Dolbear, 108, High Street, Oxford.

PLYMOUTH, DEVONPORT, STONEHOUSE AND DISTRICT.—Chemists' Association. Geo. Breeze, 36, Catherine Street, Plymouth.

SHEFFIELD.—Pharmaceutical and Chemical Society (1869). H. Antcliffe, Union Offices, Sheffield.

SUNDERLAND.—Chemists' Association (1869). R. H. Bell, 27, Thornton Place, Sunderland.

SWANSEA.—Swansea and District Chemists' Association. John Davies, 75, Oxford Street, Swansea.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE FORWARDED TO THE FOLLOWING :—

The Honorary Members.

Libraries.

American Pharmaceutical Association; British Medical Association; Chemical Society of London; École Supérieure de Pharmacie, Montpellier; École Supérieure de Pharmacie, Paris; Massachusetts College of Pharmacy; The Mason College, Birmingham; St. Louis College of Pharmacy; New Zealand Board of Pharmacy; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Ontario College of Pharmacy, Toronto; Pharmaceutical Society of Australasia; Pharmaceutical Society of Queensland; Royal Society of London; Société de Pharmacie, Paris; State of Illinois Board of Pharmacy; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Dover Chemists' Association; Edinburgh Chemists Assistants' Association; Forfarshire and District Chemists' Association; Glasgow and West of Scotland Pharmaceutical Association; Hastings Chemists' Association; Hull Chemists' Association; Leeds Chemists' Association; Liverpool Chemists' Association; London Chemists' Assistants' Association; Manchester Chemists and Druggists' Association; Midland Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association.

Journals.

American Druggist; American Journal of Pharmacy; Archiv der Pharmacie; British and Colonial Druggist; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; The National Druggist; Pharmaceutical Journal; Pharmaceutische Centralhalle; Répertoire de Pharmacie.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS :—

American Druggist; Archiv der Pharmacie; Australasian Journal of Pharmacy; British and Colonial Druggist; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie et de Chimie; National Druggist; Pharmaceutical Journal; Pharmaceutical Record; Pharmaceutische Centralhalle; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie.

PROGRAMME OF THE PROCEEDINGS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

THIRTY-SEVENTH ANNUAL MEETING, LONDON, 1900.

OFFICERS.

President. E. M. HOLMES, F.L.S., London.

Vice-Presidents.

(Who have filled the office of President.)

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PROFESSOR ATTFIELD, Ph.D., F.R.S., F.I.C., F.C.S., Watford.
S. R. ATKINS, J.P., Salisbury.
F. B. BENGER, F.I.C., F.C.S., Manchester.
C. UMNEY, F.I.C., F.C.S., London.
W. MARTINDALE, F.C.S., F.L.S., London.
OCTAVIUS CORDER, Norwich.
N. H. MARTIN, F.L.S., F.R.M.S., Newcastle-on-Tyne.
C. SYMES, Ph.D., F.C.S., Liverpool.
J. C. C. PAYNE, J.P., M.P.S.I., Belfast.

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JOHN MOSS, F.I.C., F.C.S., London.
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F. RANSOM, F.C.S., Hitchin.

Honorary Local Secretaries.

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HERBERT CRACKNELL, London.

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BOWEN, J. W., London.
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F. MAITLAND, Stonehouse, and J. H. MATHEWS, London.

Assistant Secretary.
JOHN HEARN.

Editor of the Year-Book.
LOUIS SIEBOLD, F.I.C., F.C.S.

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*BREMRIDGE, R.
BUTT, E. N.
*CARTEIGHE, M.
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COOPER, A. J. B.
COOPER, A.
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FISK, F. M.
FLETCHER, F. W.
GERRARD, A. W.
GLYN-JONES, W. S.
GOLDBY, F.
GOLDFINCH, G.
GREENISH, PROF.
GULLIVER, W.
HANBURY, C.
HANSON, A. W.
*HARRINGTON, J. F., *Vice-Chairman.*
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*HILLS, W.
HOLDING, J.
HOLMES, E. M.
HOWARD, D. L.
HOWELL, M.
HUMPHREY, J.
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KNIGHT, G.
LESCHER, F. H.
MACEWAN, PETER.
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MOSS, H.
MOSS, J.
NAYLOR, W. A. H.
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PARKER, R. H.
PHILP, W. J.
PHILLIPS, A. J.
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PROBYN, COL. CLIFFORD.
RANSOM, F.
ROBBINS, J.
ROBINSON, E. A.
ROBINSON, W. P.
SAVORY, A. L.
SHACKLOCK, J. H.
SMITH, F. A. U.
TAYLOR, G. S.
TURNER, J. S.
TYRER, T.
UMNEY, C.
WARD, J. S.
*UMNEY, J. C.
*WARREN, W., *Hon. Local Sec.*
WEBB, E. A.
WHITE, EDMUND.
WIGGINS, H.
WIGGINTON, A.

Those marked with an asterisk were on the Local Executive.

THE SITTINGS OF THE CONFERENCE WERE HELD IN THE
HOUSE OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN, LONDON,
ON TUESDAY & WEDNESDAY, JULY 24TH AND 25TH, 1900,
Commencing at Ten a.m. each day.

MONDAY, 23rd JULY.

The EXECUTIVE COMMITTEE met, according to notice from the Honorary General Secretaries, at the Hotel Metropole, London.

TUESDAY, 24th JULY.

The CONFERENCE met at 10 a.m., adjourning at 1 p.m.; and at 2 p.m., adjourning at 4 p.m.

Order of Business.

Address of Welcome by the President of the Pharmaceutical Society, G. T. W. Newsholme, Esq., supported by W. Martindale, Esq., and J. F. Harrington, Esq.

President's Address.

Reception of Delegates.

Report of Executive Committee.

Financial Statement.

Report of Treasurer of the "Bell and Hills' Library Fund."

Report of Unofficial Formulary Committee, by N. H. Martin, F.L.S.

Reading of Papers and Discussions thereon.

PAPERS.

1. *Report on Santal Wood Oil*, by Ernest J. Parry, B.Sc.
2. *Some Observations and Suggestions relating to the Chemistry of the British Pharmacopœia*, by Frederick B. Power, Ph.D.
3. *Almond Oil and its Substitutes*, by W. C. Allen and E. T. Brewis, F.I.C.
4. *Contribution to the Pharmacognosy of Official Strophanthus Seeds*, by P. E. F. Perrédès.

There was a mid-day adjournment between 1 and 2 for luncheon at the King's Hall, Holborn Restaurant.

WEDNESDAY, 25th JULY.

The CONFERENCE met at 10 a.m., adjourning from 1 to 2. The whole of the business of the Conference was completed that day at 4.30 p.m.

Order of Business.

Reception of Delegates.
Reading of Papers and Discussions thereon.

PAPERS.

5. *Notes on some Indian Drugs*, by W. Mair, F.C.S.
6. *Ash in Drugs*, by C. G. Moor, M.A., and M. Priest, F.C.S.
7. *The Pharmaceutical Plants of Jamaica*, by Theo. H. Wardleworth.
8. *Laboratory Notes*, by F. C. J. Bird.
9. *Examination of Commercial Samples of Liquor Ferri Phosphatis cum Quina et Strychnina*, by H. J. Henderson.
10. *Recovery of Waste Menthol*, by A. W. Gerrard, F.C.S.
11. *Critical Note on the Official Process for the Determination of Strychnine in Galenical Preparations of Nux Vomica*, by E. H. Farr, F.C.S., and R. Wright, F.C.S.
12. *Note on Liquor Ferri Perchloridi*, by Thomas Tyrer, F.I.C., and Albert Levy.
13. *Turpentine Oil and Terebene*, by C. T. Tyrer, F.C.S., and Alfred Wertheimer.
14. *Determination of Correct Melting Points*, by Thomas Tyrer, F.I.C., and Albert Levy.
15. *The British Pharmacopœia as a Standard for Articles of Commerce*, by D. B. Dott, F.R.S.E.
16. *Asafetida Preparata*, by H. W. Jones, F.C.S.
17. *Mercurous Iodide*, by Frederick B. Power, Ph.D.
18. *The Composition of Berberine Phosphate*, by Frank Shedden, B.Sc., A.I.C.
19. *Notes on Opium, Olive Oil, and Saccharin*, by Edwin Dowzard, F.C.S.
20. *Viscosity of Essential Oils*, by Edwin Dowzard, F.C.S.
21. *British Guiana Copaiba*, by E. Wightman Bell, F.C.S.
22. *Copaiba: Its Assay and Tests*, by E. Wightman Bell, F.C.S.
23. *Phenol Suppositories*, by F. R. Dudderidge, F.C.S.
24. *Some Pharmaceutical Tinctures*, by J. C. McWalter, L.R.C.S.I., L.A.H.I.
25. *New Apparatus for the Estimation of Chlorine and Nitrogen*, by J. F. Tocher, F.C.S.

Election of Formulary Committee.
Place of Meeting for 1901.
Election of Officers for 1900–1901.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the King's Hall, Holborn Restaurant.

In the evening there was a concert at the Hotel Metropole, followed by a dance.

THURSDAY, 26th JULY.

Excursion on the Upper Reaches of the Thames. For particulars see page 534.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING IN LONDON 1900.

THE Thirty-seventh Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, July 24th, in the Throne Room, Holborn Restaurant, and after luncheon continued and completed its sittings in the Lecture Theatre of the Pharmaceutical Society, 17, Bloomsbury Square, London, under the chairmanship of E. M. Holmes, Esq., F.L.S., London.

The following members and friends were present during the meeting :—

Aberdeen—Giles, W.; Johnston, J.
Accrington—Newton, A.
Arbroath—Jack, J.; Simpson, Miss; Naysmith, A., Mr. and Mrs.
Belfast—Nicholl, J. W.
Birmingham—Alcock, F. H.; Brunt, G. H.; Poole, J.; Southall, A.; Thompson, C.
Bootle—Swinton, T. H.
Bournemouth—Bilson, F. E.; Bridge, G. E., Mr. and Mrs.; Spinney, F.; Toone, J. A.
Blackburn—Gifford, R. L., Mr. and Mrs.
Bradford, Yorks.—Jackson, Mr., Mrs. and Miss; Silson, R. W.
Brighton—Smithson, J., Mr., Mrs. and Miss.
Bridge of Allan, N.B.—Bain, J.
Bristol—Boorne, H. E.
Burnley—Heaton, J. A.
Cambridge—Campkin, B. S.; Peck, E. Saville.
Chiswick—Strother, C. J. and Miss Strother.
Colchester—Shenstone, J. C.
Cork—Fielding, P. J. D.
Dalkey—Beggs, G. D., Mr. and Mrs.
Darwen—Shorrock, R., Mr. and Mrs.
Dowlais—Rees, R. P.

Dublin—Conyngham, H.; McWalter, Dr. J. C.

Dundee—Anderson, A. B.; Anderson, J.; Cummings, W.

Edinburgh—Care, H. B.; Clark, Dr. Inglis; Cowie, W. B.; Duncan, W.; Fraser, J. Innes; Gibson, A. and Miss Gibson; Hill, J. Rutherford; Mair, W., Mr. and Mrs.; Michie, L. P.

Exeter—Gadd, H. W.; Gadd, S.; Stocks, D. jun.; Moore, C. G.

Exmouth—Toone, A. H.

Glasgow—Brodie, R.; Currie, W. L.; Robertson, G., Mr. and Mrs.

Godalming—Norman, Valentine; Mather, J. H.

Hayward's Heath—Cripps, R. A.

Hitchin—Ashton, F. W.; Henderson, H. J.; Latchmore, A., Mr. and Mrs.; Pack, F. J.; Ransom, F., Mr. and Mrs.

Hong Kong—Browne, Frank.

Hull—Bell, C. B.

Ilkley—Worfolk, G. W.

Jarrow-on-Tyne—Rose, J. D.

Kimberley—Gasson, W.

Kirriemuir, N.B.—Ford, J., and Miss Jessie Ford.

Leeds—Blackburn, A. E.; Branson, F. W., and Mrs.

Leith—Coull, Dr. G.

Liverpool—Buck, A. S.; Evans, Ed., jun.; Marsden, Prosser H.; Smith, J.; Smith, W. Ross; Symes, Dr. C.; Wardleworth, T. H.

London—Allen, C .B.; Allen, E. R.; Allen, W. C.; Anderson, G.; Andrews, F.; Atkinson, Leo., Mr. and Mrs.; Bascombe, F.; Bate, H.; Bird, F. C.; Bird, F. C. J.; Bourdas, I.; Bowen, J. W.; Bremridge, E.; Bremridge, R.; Brewis, E. T.; Carteighe, M.; Collier, H.; Cooper, A.; Cracknell, H. J.; Crawshaw, E.; Creswell, F.; Dampney, R. C.; Dyson, W. B.; Everson, H. C.; Finnemore, H.; Forster, G. F.; Francis, A.; Francis, G. B.; Gerrard, A. W.; Glyn-Jones, W. S.; Goldfinch, G.; Grossman, E.; Gulliver, W. Fred; Gustav, Stephan; Harrington, J. F.; Heap, J. H.; Hearn, J.; Helbing, H.; Holding, J.; Holmes, E. M.; Howard, D. Lloyd; Howie, W. L.; Humphrey, J.; Huskisson, H. O.; Hyslop, J. C.; Johnson, J. R., Mr. and Mrs.; Jowett, Dr. H. A. D.; Lenton, W. H.; Lescher, F. Harwood; Lewis, S. J.; Macdonald, A.; Martindale, W., Mr., Mrs. and Miss; Martindale, Dr. W. H.; Marsh, E. R.; MacEwan, P.; Mathews, J. H.; Miles, C. J.; Minshall, Rose; Naylor, W. A. H.; Parker, R. H.; Perrédès, P. E. F.; Phillips, A. J.; Philp, W. J. I.; Pretty, C.; Priest, Martin; Robinson, R. A.; Robinson, W. P.; Sage, C. E.; Sangster, A.; Sillitoe, H. A.; Smith, F. A. U.; Solomon, A. H.; Taubman, R.; Taylor, Geo. L.;

Thomas, E. W.; Tyrer, Chas.; Umney, J. C.; Walmsley, M.; Want, W. P.; Ward, J. S.; Warren, W.; Wellcome, H. S.; Whigham, R. L.; White, E.; Wiggins, H.; Wigginton, A.; Will, W. Watson; Wink, J. A.; Woolley, S. W.; Wootton, A. C.

Manchester—Grier, J.; Johnstone, C. A., and Misses Johnstone; Kemp, H.; Kirkby, W.; Pidd, J. H.; Pidd, A. J. and Miss E. Pidd.

Mandalay—King, A. W.

Markwick, N.B.—McCorquodale, J. C.

Merthyr Tydvil—Harris, E. W.

Modbury—Lakeman, A. F.

Montrose—Davidson, A.

New Barnet—Young, R. F.

Newcastle-on-Tyne—Clague, T. M.; Merson, G. F., Mr. and Mrs.

Newport, Mon.—Davis, E.

Norwich—Watson, J. E. H.

Oxford—Druce, G. C.; Mathews, Henry.

Plymouth—Turney, J. Davy; Woods, H., Mr. and Mrs.; Woods, W. Herbert.

Salisbury—Atkins, S. R.

Sheffield—Ellinor, G.; Fox, A. R., Mr. and Mrs.; Newsholme, G. T. W.; Squire, George.

Sidcup—Hanson, A. W.

Shrewsbury—Cross, W. Gowen.

St. Albans—Ekins, A. E.

St. Leonards—Rossiter, F.

Staleybridge—Innes, D.

Swansea—Grose, N. M.; Hughes, J.

Tunbridge Wells—Hobbs, A. E.

Uckfield—Farr, E. H.

Watford—Attfield, Dr. J. and Mrs.

Windsor—Everett, J. G.

Yeovil—Wright, A.

Meeting of the Executive Committee.

A meeting of the Executive Committee was held at the Hotel Metropole, London, on Monday, July 23rd, at 5.45 p.m.

Present:—Mr. E. M. Holmes (President), in the chair, Dr. Attfield, Messrs. Atkins, Harrington, Martindale, and Moss (Vice-Presidents), Messrs. Warren and Cracknell (Hon. Local Secretaries), Messrs. Atkinson, Bowen, Collier, Druce, Turney, and

White, Mr. J. C. Umney (Hon. Treasurer), Messrs. Naylor and Ransom (Hon. Gen. Secs.), and Mr. J. Hearn (Assist. Secretary).

The minutes of the previous meeting were read and confirmed.

The Treasurer presented the Financial Statement for the past year. Mr. Cracknell suggested that a clear balance sheet should be attached to the Statement. After discussion the Statement as prepared was approved, and the Treasurer undertook to explain to the Annual Meeting the actual financial position.

The draft report of the Executive Committee was accepted for presentation to the Annual Meeting, after a clause had been added drawing attention to the unsatisfactory financial condition of the Conference.

The suggested programme of the Annual Meeting was presented and agreed to. Of the twenty-five papers that had been sent in, it was decided to decline one on the ground of its unsuitability.

The following gentlemen were appointed a Sub-Committee (with power to add to their number); to make arrangements for such additions to the matter of the *Year-Book* as in their judgment would increase its general utility and its value as an advertising medium:—The President, the Treasurer, the Hon. Secretaries, Messrs. Bird, Moss, and White.

The President suggested an alteration in the usual arrangements for the reading of papers. He thought time would be economised, additional interest secured, and the discussion more thorough, if the papers were divided into two sections, the one dealing with those of a chemical nature—the other with pharmaceutical and botanical subjects. The opinion was generally and clearly expressed that, however desirable such a change might appear, it was scarcely practicable, and that to make the change on the eve of the annual meetings would be decidedly impolitic. It was agreed to follow the usual course.

The Secretaries were instructed to send a vote of condolence to the widow of the late Mr. John Borland.

Letters in reply to votes of condolence were announced as having been received from Mr. R. F. Reynolds (Leeds), Mrs. Downes (Dublin), and Mr. R. Wilkinson (Dunedin). It was further announced that Mr. R. Wilkinson had accepted the appointment of Hon. Colonial Secretary for New Zealand in succession to his father, the late Mr. T. M. Wilkinson.

A proposed list of officers for the ensuing year was adopted for recommendation to the general meeting for election.

The following thirty-four gentlemen having been duly nominated were elected to membership :—

Anderson, John, Dundee.
Bourdas, I., Jun., London.
Browne, F., Hong Kong.
Butterworth, A., Bradford, Yorks.
Clarke, A. B., Coventry.
Cowie, Dr. W. B., Edinburgh.
Cuxson, J., Oldbury.
Dunlop, T. W., London.
Ellis, F. C., Bristol.
Gamble, F. W., London.
Gasson, W., Kimberley.
Goodwin, F. A., Plymouth.
Grier, Jas., Manchester.
Grindley, G. H., Dublin.
Hearn, J., London.
Hopkinson, W. J., London.
Howard, Geo., Tunbridge Wells.
Howard, W. R., London.
Innes, David, Stalybridge.
Jackson, H., Edinburgh.
Latreille, A., London.
Lenton, W. H., Thrapstone.
McCaw, Belfast.
Morris, E. W., London.
Newton, A., Accrington.
Pater, J. B., Sheffield.
Reynolds, R. Fred, Leeds.
Sloan, C. A., Coventry.
Smith, W. Ross, Liverpool.
Swinton, T. H., Liverpool.
Welton, H., Jun., Coventry.
Wilkinson, R., Dunedin.
Wooddisse, F. B., Kenilworth.
Young, Pelham C., London.

GENERAL MEETING.

Tuesday, July 24th.

The Thirty-seventh Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, July 24th, in the Throne Room at the Holborn Restaurant, Mr. E. M. Holmes, F.L.S., President, in the chair.

Mr. Newsholme, President of the Pharmaceutical Society of Great Britain, opened the proceedings by welcoming the Conference to London. He said it was twenty-six years since it last met in London, and during the interval it had wandered all over the country and met in some of the largest cities in England, Scotland and Ireland. During all those years it had been presided over by various distinguished members of the craft, and, although it was a separate body from the Pharmaceutical Society, it numbered amongst its members many who were also distinguished members of the Society. The Conference had done an immense amount of good work in connection with pharmacy, and they would all be pleased to see at its head a president whose reputation was equal to that of any one who had preceded him. The name of Edward

Morell Holmes was a household word in pharmacy all over the world, for, as the distinguished Curator of the Pharmaceutical Society, he had been in communication with nearly every one practising the craft. He would not occupy their time longer, but would again offer them a hearty welcome to the Metropolis, and hoped the proceedings of the meetings would redound to the credit of the Conference and the advancement of pharmacy.

Mr. MARTINDALE (Chairman of the Local Committee) said he should like to add a few words of welcome, being one of the oldest members of the Conference, as he joined it thirty-one years ago, when it met in Exeter, under the presidency of the late Daniel Hanbury. He wished especially to emphasise the social side of the Conference meetings. They had been royally welcomed and entertained at many places throughout the British Isles, and they in London wished to heartily reciprocate the kindly feeling which those meetings tended to engender amongst pharmacists.

Mr. HARRINGTON (Vice-Chairman, Local Committee) also added a few words, saying he hoped the visitors would have a good time in London, and if they had fine weather and short speeches he had no doubt things would go comfortably and smoothly.

The PRESIDENT said he was sure he should be expressing the feeling of all present when he said how highly they appreciated the welcome accorded to the Conference by the President and Council of the Pharmaceutical Society of Great Britain in providing such a magnificent room for its opening meeting, and in placing the rooms of the Society in Bloomsbury Square at its disposal. The Conference was the child of the Society, and at the time of its first visit to the Metropolis it was a child only eleven years old. Since then it had visited many of the principal towns and cities of Great Britain and Ireland, and now, at the mature age of thirty-seven years, the wanderer had returned to the home of its parent, the Pharmaceutical Society, to find itself welcomed with open arms, and the best that the house afforded placed before it. In fact, it was a right royal welcome that it received, for was it not welcomed in the Throne Room and dined in the King's Hall? They trusted that the hearty welcome so gracefully expressed would serve to cement the bonds that already existed between the Society and the Conference, and that the latter might be able to show its gratitude by rendering any services that might be possible to further the interests of the parent Society. Might the old firm become all the stronger for the help of the junior partner in its work! He very much regretted that the President of the Conference in London

in 1874, his old friend Mr. T. B. Groves, F.C.S., was unable to be present on this unique occasion, when the Conference was welcomed by a country President of the Society, who thus represented in his own person a double welcome—one from the country and one from the metropolis—a presage, it might be hoped, of greater union in the ranks of pharmacy in the future.

Mr. ATKINS said it might not be inappropriate if he intervened at this stage with a few words. Reference had been made to the fact that at the last meeting in London, twenty-six years ago, his old and much-esteemed friend, Mr. T. B. Groves, was President of the Conference, and he ventured to suggest that it would be a graceful thing if they sent him a telegram of congratulation. It was a source of regret to Mr. Groves and to himself that he was not able to be present, because, though his general health was fairly good, his hearing was so seriously impaired that he was unable to take part in any public proceedings. He was quite sure that a telegram of congratulation would be very graciously received by Mr. Groves.

The suggestion was received with acclamation, and the following telegram was sent at once :—

COPY OF TELEGRAM TO MR. T. B. GROVES, WEYMOUTH.

"The President and Members of the British Pharmaceutical Conference, now assembled in London, send hearty greetings to the President of the Conference in London, 1874, and desire to say with what pleasure they would have welcomed his presence amongst them."

The PRESIDENT then proceeded to deliver the

PRESIDENT'S ADDRESS.

Ladies and Gentlemen,—The selection of a subject for an address to the members of so scientific a body as the British Pharmaceutical Conference has doubtless been a matter of painful consideration to the wiser men who have preceded me in this chair. The history of pharmacy has already been told. The most recent discoveries of science, chemical, physical, and pharmaceutical, are annually recorded in the *Year-Book of Pharmacy*. Even in the subjects of botany and materia medica there can be nothing new to bring before you that enterprising journals have not already provided for critical readers. But the closing year of the century

seems to be the appropriate time for reviewing the progress of science, so far as it affects pharmacy, and for striving to obtain some idea of the changes that have been brought about during that period. It is only by comparing the beginning and the end of the century that we can realise how vast those changes have been. At the beginning of the century chemistry had made but little advance. The metals of the alkalies and alkaline earths, such as sodium, magnesium, aluminium, and many other metals, such as nickel, tungsten, and uranium, which are now articles of commerce. sold by the hundredweight or ton, had not even been discovered, To-day, magnesium is used in fireworks, uranium and cobalt in glass manufacture, nickel and tungsten in the armour plates of warships, and aluminium bids fair to rival zinc and copper in usefulness. Not a single active principle had been extracted from plants; morphine, strychnine, quinine, and cocaine, the manufacture of which is to-day conducted on a very large scale, were then absolutely unknown. Chloroform, chloral, glycerin, carbolic acid, and many articles, the names of which are now household words, had not been discovered. Electricity was in its infancy, and was not dreamt of as a power that would, when chained to man's service, revolutionise the world of science. Surgical operations that would not have been thought possible in the beginning of the century, and that fifty years ago were almost invariably fatal, are now performed without pain and with very trifling risk by the aid of antiseptics and anæsthetics. Virulent diseases that formerly decimated the population, such as cholera, plague, and diphtheria, are now regarded as within the range of successful treatment by antitoxins and specially prepared serums.

Travelling has increased in speed from that of the stage coach to steam or electric traction at forty to sixty miles an hour, whilst 200 miles an hour has been considered within the range of possibility, and to-day submarine ships and aerial vessels are accomplished facts. The civilised parts of the globe have been covered with a network of railways. London is tunnelled underneath like a rabbit-warren with railway lines, and covered overhead with a cobweb of telegraph and telephone wires. Men in one warehouse can talk with others at a distance that has yet not found a limit, the very tones of the voice can be locked up in paper and produced at will, so that the phrase, "he being dead, yet speaketh," has a new signification. Messages can be sent through the air by the aid of electricity, without the aid of intervening wires and without being detected until they reach their destination. Heat, powerful

enough to volatilise the most refractory metals and to form gems, has been obtained by the use of the electric furnace, and the absolute zero of cold has almost been reached by the solidification of hydrogen. The spectroscope has revealed the chemical constituents of other worlds and new elements in this one. Rays of light, hitherto invisible, have been utilised in surgery and dentistry and skin diseases. In botany the microscope has revealed that bacteria, or plants of the lowest organisation and the most minute size, are the cause of zymotic diseases. A practical use has been made of the disintegrating powers of those minute plants in the purification of sewage by their means, in improving the land by the nitrifying properties of some species, and in the destruction of animal pests by infecting them with the spores of others.

But the great characteristic of the century is that the rate of progress in science has been far more rapid than in any previous one known to the human race. The enormously developed powers of locomotion and facilities for inter-communication have naturally had an effect on commerce and, together with the increase of population, have brought three apparent evils in their train, viz., centralisation, competition, and co-operation, all of which affect pharmacy no less than other professions and trades.

The Progress of Pharmacy during the Century.

At the commencement of the century chemists and druggists had just begun to separate into a distinct body from grocers and general dealers. But it was not until 1842, when they obtained a Royal Charter of Incorporation, that they began to assume the character of an educated body. As the semi-professional character of the business became recognised, in consequence of the examination and education that chemists were compelled to undergo, the number of young men entering it gradually increased. These were and are still drawn largely from respectable families with small incomes, who, misled by the small amount of capital necessary to start a business, and the reputed large profits, do not recognise that the returns are usually so small that the grocer and draper can make eight or ten times more money, even on small profits, than a chemist is able to do. Nor is it generally recognised that the business depends far more than in any other trade on the personal integrity of the proprietor, and that it takes time to acquire the confidence of the public. The fact that the keen financial instincts of the Jews have never led them to embark in

pharmacy might have served to indicate to the general public that the business of the chemist and druggist is not so lucrative as is generally supposed. The wills of pharmacists never present large figures, and millionaires are unknown in British pharmacy. Nevertheless, the supply of dispensers of medicine has exceeded the public demand. The principle of free trade has prevented such a limitation of the number of those engaged in pharmacy as is prevalent in some other countries, with the result that, like all other trades and professions in this country, its ranks are overcrowded. At the present time there are about 15,600 registered chemists and druggists, of whom it is estimated that about one-tenth only, whom for convenience we will call pharmacists, actually derive their principal income from the dispensing of prescriptions, a small number from what is known as counter-prescribing, and the remainder from light retail and dispensing business, the dispensing being a comparatively small proportion. In some parts of the country, especially in Scotland, there is a much larger proportion of pharmacists who dispense medicine than in England. Even in different parts of England, in some towns, the medical men almost invariably dispense their own medicines, whilst in other towns a few miles distant the dispensing is done almost entirely by pharmacists for the medical men. The cause of these local differences seems worthy of investigation, which might lead to more uniformity of practice. There is little doubt, as was pointed out last autumn by Dr. Leech (whose premature decease we all deplore) that the practice of pharmacy by doctors is not only an evil to the pharmacist, but a disadvantage to the medical men themselves, and that medical men would gain if, wherever possible, they gave up dispensing. It is obviously for the safety of the public that every dispenser of medicine, whether employed by a pharmacist, by co-operative stores, or by a medical practitioner, should have passed a qualifying examination in the art of dispensing medicines, and that every medical man who dispenses his own medicine should have passed the same examination in the subject as the pharmacist whose duties he takes upon himself. But under the modern system, the medical student, although he has the opportunity of taking up a course of pharmacy at a hospital or medical school, is often not very conversant with the subject. The safety of the public is best secured when the dispensing of prescriptions is checked by a second or third qualified dispenser, as is the case in dispensing establishments where several assistants are kept.

In respect of poisons the public especially needs protection, inas-

much as it does not know their properties nor their antidotes, and the chemist and druggist—as being familiar with both—and therefore capable of devising suitable precautions to safeguard their use and to give advice in cases of accidental or other wrongful uses of them—is obviously the fittest person to sell them, whilst it is probably largely due to his lack of energy and want of business enterprise that the poisonous articles used in the arts and for sanitary, insecticidal, or horticultural purposes have not always passed through his hands.

There is another direction in which the safety of the public is likely to be affected. Drugs vary exceedingly in quality. In order to sell cheaply at a working profit, it is necessary to buy cheaply. As prices are lowered by co-operative stores the tendency will therefore be to buy inferior qualities to meet the demand for low prices. An instance of this has recently come before us in which, owing to the use of an impure, and, therefore, cheaper, sulphuric acid by the large manufacturer, the arsenic it contains found its way into a medicinal preparation of sodium phosphate. Pure sulphuric acid, which is more expensive, and which should have been used, is free from arsenic. In the case of drugs used in medicine this will probably often lead to serious results, since when medicine is required to act quickly and effectively, as in croup or in parturition, etc., if the ipecacuanha or ergot be of inferior quality serious danger to life may result through their want of activity. In Russia, Germany, Scandinavia, and Greece, this difficulty is met by a legalised tariff for dispensed medicines. In this country it is left to the public themselves to judge by the price of the medicine and the personal character of the seller whether they obtain the best quality of drugs or not. The public, however, need to be instructed that the British Pharmacopœia upholds a high standard of purity in medicine, and the importance of asking for B.P. preparations might well be taught to the laity by the wider use of these two letters on ordinary labels.

It has been stated by medical men that what is known as counter-prescribing by pharmacists is one of the causes why dispensing is not entirely handed over to the latter by the medical profession. The subject is no doubt surrounded with practical difficulties, but probably these are not insuperable. There is no law to prevent a man, however ignorant he may be, from prescribing remedies for himself, his friends, or his household, and it has been stated on high medical authority that it would not be objectionable for persons to apply at a pharmacy "for simple remedies for tooth-

ache, muscular pain, or trifling dyspeptic ailments, provided the person seeking relief knew what he was about and was not deceived by the assumption of an authority, or of titles, on the part of the chemist, and provided that such relief was merely to be regarded as first aid, or a temporary expedient" for a definite complaint stated by the patient.

But this is a very different state of things from what is known as a prescribing business, in which the chemist goes beyond his province in diagnosing disease and supplying remedies for it. In such business the straightforward plan would be for the proprietor to qualify as a medical practitioner, or to arrange with a properly-qualified man to see his clients. The converse of this is the medical practitioner who keeps open shop like a chemist, and to whom is largely due the difficulty that the uneducated public find in distinguishing between a chemist's and a doctor's shop. It might be possible, perhaps, for representatives of the medical profession and the Pharmaceutical Society to arrange a conference to make mutual provisions for counter-prescribing by chemists to cease on the one hand, and the keeping open shop by doctors on the other. This would need disciplinary powers for both bodies to deal with offenders, but the two bodies united could probably, by a good organisation, bring sufficient influence to bear upon the Government to pass an Act authorising such powers.

The real difficulty for the conscientious pharmacist lies in the impossibility of ascertaining whether the case, very often that of an absent person, comes within the limits of first aid or temporary expedients. This difficulty would probably be met most satisfactorily if a small official work were issued by the General Medical Council, or by Government authority, to the general public, indicating on general lines the premonitory symptoms of dangerous or zymotic diseases, such as would distinguish, for instance, an ordinary cold from incipient pneumonia, or a sore throat from approaching diphtheria or scarlet fever. Such a work in the possession of the heads of families, and on the desk of every chemist, might serve to indicate both to the public and the pharmacist a dividing line between first aid and the necessity for medical treatment and supervision. Another difficulty lies in the fact that in small villages, where there is no chemist and no carrier, it is difficult for the doctor to avoid dispensing. Here, however, is the opportunity for the enterprising chemist in the nearest town to see that the medical man has a portable outfit, which he can carry with him on his rounds. The advantage of such portable medicine chests in country

villages, and for travellers, has already been recognised by enterprising London firms, which have adopted and enlarged upon the hint given by Brockedon's compressed potassium bicarbonate of fifty years ago.

The increase in the rapidity of travelling, and the absence of an international Pharmacopœia, has caused a demand for portable medicines, which has been increased by the opening up of new countries where it is impossible to obtain medicine, so that a new industry in this direction has been developed, in which English pharmacists, with characteristic conservatism, have allowed Americans to take the lead. The great advantage in the saving of time by the use of portable medicines to both the medical practitioner and the patient—in country districts where there is no chemist within several miles, and where the considerable delay in the delivery of medicine, by reason of the distance, is often of serious importance—is almost certain to lead to the permanent adoption of such time- and labour-saving devices. The value to the public of portable medicines for travelling purposes cannot be denied, as well as to the Government, since in military and naval operations the sudden demands made upon medical stores and appliances necessitate the use of drugs and preparations occupying as little space as possible, in a form as concentrated as is compatible with safety, and not readily affected by the vicissitudes of climate. This form of medicine has, therefore, become a feature of the pharmacy of to-day and is likely to develop still further. It has, however, the disadvantage of placing in the hands of the laity powerful remedies which they are apt to use without proper medical advice, and without the ability to judge of the nature of the disease for which they employ them.

The vast number of new vegetable, chemical and animal remedies introduced during recent years, and the impossibility of keeping pace with them, on the part of the medical men and the pharmacist, especially in the provinces, where, as a rule, new remedies do not come into use until two or three years after introduction into city practice, has led to the comparative disuse of the Pharmacopœia for prescribing purposes, and to more dependence being placed by physicians, concerning new remedies, upon such works as Martindale's *Extra Pharmacopœia* and Squire's *Companion to the British Pharmacopœia*, works which enterprising pharmacists have produced to meet the necessities of medicine and pharmacy during the time that elapses between the publication of one pharmacopœia and another. These works have also the additional

advantage that they contain tables of diseases, and of all the most modern remedies used for them, as well as the doses and formulæ showing useful combinations of the various preparations.

In these rapidly progressive times the Pharmacopœias cannot, even if published decennially, be actually up to date; it can only crystallise into a definite shape formulæ that have already been in use for some time. The Pharmacopœia is now really more used by pharmacists as a standard for insuring uniformity in official preparations than by physicians for prescribing purposes. It is only just, therefore, that pharmacists as a body should have an influential voice in its construction, especially as they have shown by publication of numerous formulæ that have been accepted in the previous Pharmacopœias that they are quite capable of devising approved formulæ. The medical profession must, of course, necessarily determine what remedies and preparations shall be included in it for their convenience.

The Pharmacopœia as a Legal Standard.

Many vexatious prosecutions of chemists have resulted from the fact that the British Pharmacopœia has been erroneously supposed by many analysts to be a legal standard for the purity of drugs. The statement in the Pharmacopœia that the work is "intended to afford to the members of the medical profession, and those engaged in the preparation of medicines throughout the British Empire, one uniform standard and guide, whereby the nature and composition of substances to be used in medicine may be ascertained and determined," in no way indicates that it is to be used as the legal standard of purity for drugs used in commerce for domestic and technical purposes. To prosecute chemists because, for instance, tincture of myrrh, which is used as a dentrifice rather than as a medicine, or benzoin, which is used in French polish, etc., or soft soap, or ammonium carbonate, soda water, or other articles in regular household use, do not answer to the tests of purity of the B.P., would constitute an interference with trade that would be as absurd as it would be vexatious. That the standard of purity used in dispensing physicians' prescriptions should be as high as it is possible to make it, is an article of faith of the B.P.C., but there are many cases in which drugs and preparations which are B.P. articles are used for other than medical purposes, and for such the average or normal condition of purity meets all the requirements of the case. There is, therefore, a

need for a published standard of normal or average purity of drugs for this purpose, until such time as the Government realises its duty to publish a legal standard, by which the provisions of the Sale of Food and Drugs Act can be effectively and justly carried out. In the absence of any definite Government standard for drugs, this is a work which analysts, in conjunction with pharmacists, should take up, and one that the Conference should support, in the interests both of the public and of chemists themselves.

There appear to have been several causes that led to the erroneous supposition that the B.P. is a legal standard for the purity of drugs. One is the misleading use of synonyms in the B.P. The names of commercial products in several cases in which they differ considerably in composition from the official article, are given as synonyms, such as "milk of sulphur" for *Sulphur præcipitatum* and "soft soap" for *Sapo mollis*. Such synonyms are misleading, and serve no useful purpose, since medical practitioners never use them in their prescriptions, and they might well be omitted. Another cause that leads to unjust prosecution is due, apparently, to the ignorance that exists amongst analysts who are not also pharmaceutical chemists concerning the rapid changes that many vegetable and other preparations undergo when kept in stock. Indeed, it would be a considerable advantage to both analysts and the public if the former were required to pass the Major examination of the Pharmaceutical Society before going in for the more stringent chemical examination of the F.I.C., since a knowledge of the physical and histological character of crude drugs is practically essential to the accurate determination of their purity, or otherwise.

It may here be remarked that a fear lest the B.P. might be used as a legal standard seems to have had a deteriorating influence on its construction, having apparently led in some cases, such as those of myrrh and aloes, to a lowering of the limits of purity, so that it is possible for very inferior qualities of the same drug to be sold and still meet the B.P. requirements. Such latitude is deplorable, since it leads to unfair competition, and affords no security to the public that they get the article they want when they desire that their medicines—for instance, compound liquorice powder, Gregory's powder, or confection of senna—should be of the best quality and effective action, even if prepared according to the B.P.

An International Pharmacopœia.

A General Pharmacopœia, that would enable a pharmacist to dispense a prescription with uniformity in any pharmacy on the Continent, may be regarded as a utopian rather than a practical idea, and could only be attained by alphabetically arranging in dictionary form all the formulæ in all the known pharmacopœias. But there can be no reason why an approach towards it should not be made by a Congress of medical men and pharmacists, limiting their attention, in the first place, to poisonous preparations only, and, in order to avoid international jealousies, adopting as a standard the formulæ that approach nearest to decimal proportions. The comparison of different formulæ is rendered a simple matter by the publication of the different strengths of preparations of the various pharmacopœias in Squire's *Companion to the British Pharmacopœia*. The next step might be to make uniform the strength of the most generally used preparations that are not poisonous. A really useful International Pharmacopœia cannot be otherwise than a gradual growth.

The introduction of standardisation of the more powerful preparations of the Pharmacopœia, and the stringent chemical and microscopical tests now ordered in that work to ascertain the purity of drugs, cannot be carried out in any but large businesses where several assistants are kept, and where one man can devote his whole time to testing drugs and standardising preparations. Hence the personal guarantee of the purity of the preparation he supplies is passing out of the hands of the single-handed retail pharmacist.

The increase of knowledge in every branch of medical science has caused the study of pharmacy, pharmacognosy, and dispensing to be somewhat neglected, and forced them to occupy a comparatively unimportant position in the curriculum of medical study, so that the art of prescribing is in danger of being lost. The medical practitioner—anxious to utilise the most recent improvements in scientific remedies, but with his time fully occupied in visiting patients and diagnosing disease—consequently indicates what he requires to the pharmacist, who readily supplies him with a list of formulæ compiled from the most recent publications, or specially devised to meet the wants of the prescriber, who accordingly chooses from those put before him the one he considers most suitable. Naturally, these preparations can be more economically prepared on the wholesale scale. The retail pharmacist has little

chance of success unless he can conduct his operations on the large scale, and many of the more enterprising are therefore turning their businesses into limited liability concerns. Co-operation is a growth of the times; an outcome of competition. Judging from past history, it is as unwise and useless to attempt to oppose the growth of co-operation as it was for the courtiers of Canute to ask him to forbid the advance of the sea. Co-operation has come to stay, and, like a forest fire, can only be met by similar tactics, *i.e.*, by co-operation. The only hope for a livelihood for those who have not much capital is in co-operating with those who possess it, a co-operation of knowledge with business capacity.

With respect to the use of the titles, "Pharmaceutical Chemist" and "Chemist and Druggist" by companies, it is difficult to find any sound objection to this, provided all the members of the company are legally qualified to use them; but where they are not, and company laws are utilised to cover incompetent persons who have possibly failed to satisfy the legally-appointed examiners of their competency to dispense medicine, such an illogical and unjust use of the titles should be uncompromisingly opposed by a thoroughly well organised political resistance to any Bill proposing it. In other words, no company should be allowed to use a legal title for which its members have not the qualification prescribed by law. The logical result of such a concession would be to nullify the Pharmacy Act, since if one man who fails to pass an examination in pharmacy can join with six others to form a limited liability company which can use the titles of pharmaceutical chemists or chemists and druggists, a number of persons would be able to do what the law has expressly stated one man may not do. The injustice that would thus be done to those who have already expended much time and money to obtain the title is so obvious that it can hardly be possible that disinterested and conscientious legislators could support such a provision for disregarding vested interests, or could adopt the principle it would involve, of making one law to enable persons to evade another.

Another change noticeable during the latter part of the century has been the enormous increase in the public demand for what are known as patent medicines. This may be seen from the amount derived from the sale of medicine stamps, which has increased from £43,692 in 1860 to £266,404 in 1899. The preparations commonly alluded to under this heading consist in reality of at least three different classes.

1st. The quack medicine, a preparation advertised to cure everything, or nearly so.

2nd. Proprietary medicines, such as chlorodyne, liquor opii sedativus, liquor bismuthi, fluid magnesia, pepsin wine, etc., which have some real value as medicinal agents, and have been so much prescribed by medical men that in many cases official imitations have been introduced into the Pharmacopœia.

3rd. Proprietary articles for domestic use, such as perfumes, hair lotions, peptonised and pancreatised and malted foods, inhalers, court plaister, and skin soap.

Articles in the first class are objectionable from every point of view. But proprietary medicines are often the result of the application of chemical knowledge and pharmaceutical skill in advance of the time, and, as such, and as comprising also the personal element, have a value of their own. So long as they are prepared by one person, directly interested in the excellence and uniformity of the productions, they are even more likely to be uniform in character than a B.P. preparation prepared by different operators within the too often wide limits of quality of drugs allowed by the descriptions and tests of that work. Proprietary articles, as distinct from proprietary medicines, are usually started to meet a public want, and, although their sale doubtless depends largely on advertisement, they would soon go out of use, like date coffee, if they had no intrinsic merit of their own.

Those articles, therefore, form a part of the chemist's business that is worthy of attention from another point of view than that of retail sale. Whilst the limit of profit is reduced by the competition of stores to a level at which it does not pay the chemist to keep his money lying idle in stock, the obvious remedy is for the chemist not to retail any proprietary articles except his own or those which are protected by the P.A.T.A. Each chemist should manufacture his own specialty, since the manufacturer's profit is certain, and can be arranged at a paying rate, whilst that of the distributor is not so in many cases. The stores and large capitalists can alone make these retail sales pay at the present ruinous prices by buying in very large quantities, and the heavier their stock, and the more numerous the articles they are compelled by the demands of the public and by advertisements to keep in stock, the less profit they will get, until a time arrives when the interest lost on money lying idle in such stock must lead to the raising of prices or to giving up the sales.

is a somewhat anomalous one. As hitherto practised in this country, it consists, like the fabulous mermaid, of two incongruous halves. On one side it is a business, which, to be successful, must be carried out on business lines; on the other side it is a profession, which should be conducted in accordance with professional principles. But as both are usually carried on in one room the public finds a difficulty in discriminating between them, and concludes that the price paid for the dispensing of medicine represents an enormous profit on drugs, instead of being partly a legitimate profit and partly a very small professional fee, no allowance being made for the skill and knowledge bestowed on the preparation of medicine nor for the responsibility of insuring accurate dispensing. This is not to be wondered at if the pharmacist himself does not draw the distinction, but carries on both the business and the profession in one and the same room. Patent medicines and packed goods, and ready-made preparations which require no skill and entail no responsibility, cannot be sold at professional prices, and it should not be a matter of surprise, if such prices are demanded, that business men step in and sell them according to business methods. The two departments must be kept quite distinct if the public is to recognise the professional side of pharmacy. But the public is perhaps beginning to understand that there is such a side, for in cases of serious illness most people prefer to have their medicine dispensed by firms whose reputation as accurate and conscientious dispensers is unquestioned, rather than at stores. If the public has not yet learned that there is as much difference in the qualities of drugs as there is in the quality of tea, coffee, and other groceries, it is the fault of the druggist for not pointing it out and proving that those who sell cheaply must necessarily buy cheaply, since a business man is not likely to sell the best article at the price of the lowest and try to live by the loss.

So long, however, as the Pharmacy Act of 1868 continues in operation it is almost impossible for the pharmacist to divorce his business and profession. He is faced by the position that the Government requires from the pharmacist, for the safety of the public, an expensive and tedious course of study before he can legally acquire the title of chemist and druggist, and before he can supply certain scheduled poisons to the public, although he may rarely see a prescription, and other traders can sell other poisons,

equally fatal and more frequently used, such as carbolic acid. Those, therefore, who live in districts where the business obtainable partakes more of the nature of that of a general dealer in chemical substances used for technical, agricultural, or horticultural purposes, and involving no personal responsibility, only pass the qualifying examination because they are obliged to do so by law, not because the knowledge of dispensing is of much use to them. This class forms probably at least three-quarters of those engaged in business as chemists and druggists, especially in the more populous centres in the Midlands and North of England. What they most need is a commercial education, instructing them in business methods and modern requirements. This has not hitherto formed part of a pharmacist's education, and therefore the importance of the course of commercial education which has been started in some of our Universities, and already forms an optional subject in the Philadelphia College of Pharmacy, cannot be over-estimated—at all events for those chemists and druggists who have to depend chiefly upon the sale of miscellaneous chemical and other articles rather than on dispensing. The conditions which have hitherto obtained in the retail trade of chemists and druggists have not during the last fifty years been favourable for acquiring a useful knowledge of business methods, and such knowledge has undoubtedly in some cases been sought in a practical form at co-operative stores in the same way that Germans come to this country to learn English methods of business and then use them against us. The stores have, at all events, served a good purpose in tending to cause co-operation among chemists themselves. Co-operation can only be successfully met by co-operation, and when competition has lowered profits to a point at which it is impossible to live, the natural reaction is bound to follow in the form of combinations or trusts to keep up the price to a remunerative ratio. This has been manifested already in connection with the paraffin oil and cotton thread industries and iodine, and the P.A.T.A. represents a step in the same direction.

The Future of Pharmacy.

The history of the closing century indicates that scientific progress may be expected to be increasingly rapid in the coming one. As each new theory opens up new roads of discovery, new trades will follow, or a differentiation of old ones. The pharmacist or dispenser of medicine will probably find enough to do in connec-

tion with new synthetical products, proprietary articles requiring knowledge and skill, and new medical appliances. The chemist and druggist will find that he must keep pace with discoveries in chemistry and the technical uses of new chemicals, and will learn to realise the meaning of Dr. Playfair's maxim, that the competition of industries is the competition of intellect.

As the science of sanitation increases, and the laws of health become better known, demands for antiseptics and preservatives of all kinds, both for public and domestic purposes, are certain to increase, and the time may come when liquid air or liquid oxygen will be as commonly sold for sanitary purposes as potassium permanganate is at the present day. The study of animal chemistry, as yet in its infancy, may lead to the preparation of foods that will involve no waste of energy in digestion, and in combining the maximum of nutrition with the minimum of space. The immense importance of such concentrated foods for travellers, and for armies engaged in districts where transport is difficult, may be easily conceived.

The investigation of cellulose and protoplasm will probably reveal to chemists the methods by which gum, wax, fats, oil, starch, and even alkaloids and glucosides, are formed by plants, and before another century is over it may be as easy to obtain artificially by chemical means all these important commercial products from sawdust as it is to prepare glucose at present.

The knowledge that bacteria and ferments can produce substances which result in their own destruction will probably be carried out to its logical conclusion, until for all diseases resulting from these causes appropriate antidotes will probably be discovered and kept in stock by the pharmacist, by whom means of preserving them in active condition for a definite time will have to be discovered. The study of the healthy glandular secretions of the human body as remedies in disease will almost certainly lead to a study of the chemical processes by which they are formed and the attempt to produce them artificially. This, again, may possibly be followed by an investigation of the nervous stimuli under which they are produced in nature, and to the properties of the nerve force which cause the secretion of the various fluids produced by the glandular system for the reparation of bodily waste.

Another and far-reaching object of research may be the scientific investigation of the inter-relationship of mind and body, the possibility of disease being caused and cured through the mind, or by the power of the will to control the supply of nervous force to the

various organs of the body. Possibly many of the diseases attendant on lowered vitality might thus be successfully combated.

A study of the laws regulating the curious phenomena of idiosyncracy, which is one of the greatest hindrances to the scientifically accurate treatment of disease, may lead to the possibility of preventing it, or curing it at an early stage by hypnotic suggestion, or other means. But whatever discoveries the future may have in store, the existence of the pharmacist will in any case depend upon the power of accommodating himself to new conditions, and his ability to turn to practical account the very latest discoveries in science.

Obituary.

It is always one of the most painful duties of the President of the Conference to have to record the death of any of its members. During the preceding year the loss has been unusually heavy. Three of its past-Presidents and one Vice-President have entered into their rest. Mr. Thomas Greenish, not only as President of the Conference, but as President of the Society, exercised a powerful influence for good. Quiet and unostentatious, but with an exceptional amount of common sense, he dealt with the pharmaceutical problems of the time with a shrewdness that has left an impress on pharmaceutical politics to this day, and his address both before the International Pharmaceutical Congress in London, in 1871, and his presidential address at the Conference meeting in Birmingham, in 1886, are even under present circumstances worthy of careful perusal. Having visited most European countries, as well as the United States, and having interested himself in the condition of pharmacy in each, he acquired broad and just views of pharmacy. His address to the Conference was in every sense an ideal one, suggestive and practical. The Unofficial Formulary of the Conference is an outcome of one of his suggestions, the federation of local associations may be said to be another, and a third is apparently approaching consummation—viz., that there should be in the future revision of any national Pharmacopœia a permanent committee or commission comprising amongst its members the largest possible number of pharmacists. In Mr. Greenish the Society has lost a wise counsellor and the Conference one of its most distinguished and useful Presidents.

The death of Mr. E. C. C. Stanford was a great surprise and grief to his many friends. Beloved by all who came in contact with him for his geniality and kindness of heart, and respected for

the intellectual powers which rendered him a most interesting companion, no face will be more missed at the Conference meetings. Always an investigator, he kept up to date with modern discoveries, and he was especially interested in seaweed products, and made them the business of his life. Iodine was the keynote of his work, and its presence in the thyroid gland secretion was the subject of his last paper before the Conference. He was one of the founders of the Conference and President of the meeting at Edinburgh in 1892, and largely contributed to the very successful character of the meeting. He will live long in the hearts of his friends, and his discovery of algin will keep his name in the rolls of science as an investigator.

Mr. Richard Reynolds, who died on April 5, 1900, was one of the founders of the Conference, and acted as Hon. Secretary in conjunction with Dr. Attfield from its foundation till 1871. He was President of the Conference in 1881, at the meeting at York. In his early days he was much interested in botany and natural science, and it was he who suggested the Phytological Club, of which he was the Hon. Secretary. Specimens of rare plants collected by him, Mr. H. Deane, Daniel Hanbury, and H. B. Brady, and other members of the Club, are still in the British Herbarium of the Society's Museum. In his latter days he took equal interest in horticulture. His life was one of continuous industry, largely in the public interest. He was an examiner of the Pharmaceutical Society when the appointment was unremunerative, acted as a Councillor of the Society from 1869–1870, and was first chairman of the Chemists' and Druggists' Association of Great Britain, founded in 1876 as a defence association for chemists against the injurious proceedings of public analysts. One marked feature of his character was the persistence with which he carried to a successful issue any object which he was satisfied was a good one. This was shown especially in his work as Hon. Secretary to the Yorkshire College of Science, and in his opposition to the use of methylated spirit in tinctures. As one of the unobtrusive but distinctly influential pharmacists of his day, the death of Mr. Richard Reynolds will be widely felt as a severe loss both to the Conference and the Society.

The loss Irish pharmacists have experienced by the death of Mr. R. J. Downes, late President of the Pharmaceutical Society of Ireland, seems to emphasize the fact that the Conference is the only body which binds Irish and British pharmacists in a common union. Mr. Downes was most highly esteemed in Ireland as a

conscientious, high-principled, genial gentleman, and fulfilled the responsible duties of his office in a manner that inspired respect on both sides of the Channel. The members of the Conference who had the privilege of his personal acquaintance join with their Irish compatriots in regretting his early death, when apparently he had a life of much usefulness before him.

Even within the last fortnight death has been busy, and has removed at the ripe old age of 80 Mr. John Borland, one of the oldest and best known pharmacists in the West of Scotland, who well upheld the reputation of being a high-class pharmacist, taking a practical interest in art, literature, and natural history, and being widely respected for his scientific attainments. He acted as Examiner in Botany for the North British Branch of the Society, and for five years was a member of the Council of the Society. His modest and unassuming manner and singularly amiable character endeared him to all who came in contact with him.

Mr. C. B. Allen moved a hearty vote of thanks to the President for the admirable address he had given. It might be a matter of surprise to some of them that Mr. Holmes had been able to give such a thoroughly practical pharmaceutical paper, which he hoped would be read by pharmacists in all parts of the country. The old adage that the looker-on saw most of the game was pretty well illustrated by this address; he had touched on the whole question of pharmaceutical politics and on the difficulties which occurred in the business without an appreciable stumble, though he had had to traverse some dangerous ground. There was a good deal of argumentative matter in the address which he hoped would be thoroughly threshed out at the proper time. The pharmacy of the future would no doubt be very different to that of the present day, but he would not go into that now.

Mr. Atkins, in seconding the proposal, said he would not for one moment stay to examine the address, which he had no doubt would be very carefully read and pondered, for it furnished a large amount of matter for consideration and for practical adoption. He would content himself by very heartily congratulating the author of the address. Mr. Holmes occupied a unique position. He could not conceive anything more appropriate than that in London, the centre of the pharmaceutical universe, Mr. Holmes should be the President. There was a fitness in things, though they might have been somewhat accidental in their arrangement, which, when they

came to pass, they emphatically recognised. Without paying the President any undue compliment, he thought there was not a man amongst them who had been more generally consulted by the younger pharmacists than Mr. Holmes. He ventured to say from a somewhat wide observation that no student ever went to Mr. Holmes with a question and was brusquely turned aside; in fact he would go further and say that if Mr. Holmes had a fault, it was that he made himself too accessible, for his brains had been at the command of everybody. There were men scattered throughout the world to-day who had in correspondence attested that when they were students in Bloomsbury Square, or when they called at Bloomsbury Square with a substance or a plant or product which they did not know and took it to Mr. Holmes, if he did not know what it was nobody did. He did not know that they could give a higher testimony to the scientific attainments and work of their friend than by heartily thanking him for the admirable address which he had delivered.

Dr. JOHN ATTFIELD said, as the senior Vice-President there, it became his duty to put the resolution to the meeting. He cordially supported every word that had been said respecting Mr. Holmes's work. The President might, of course, have given them a learned address on that subject respecting which he was the greatest living authority—viz., pharmaceutical botany. As a botanist, no man living had done more service to pharmaceutical science and the art of pharmacy than Mr. Holmes; he might also add to medicine, and, of course, therefore, to the public, for whom medical men and pharmacists existed. No man had done more service to the Pharmaceutical Society, whether as Curator of the Museum or as the author of researches relating to pharmaceutical botany. He had not, however, delivered a botanical dissertation, but had chosen, in the happy words of Mr. Allen, as an onlooker of the pharmaceutical game, to give them one of the most comprehensive addresses to which it had been his privilege to listen.

The motion was then put, and carried by acclamation.

The PRESIDENT said he felt it very difficult to respond in suitable terms to the very kind, flattering, and somewhat imaginative speeches which had just been made. He felt very grateful to the audience for the patience with which they had listened to a somewhat lengthy address. He feared it was not "of the nature and quality demanded," or at all events expected, of the President, but if he had followed the example of his illustrious predecessor at the last meeting in London, it was because he felt that the

problems of the present and future possessed more genuine interest than botanical or allied subjects. He did not expect the views he had expressed would meet with universal approval by those engaged in practical pharmacy, but he should be content if they were deemed worthy of perusal, as those of one who had for a quarter of a century regarded the practice of pharmacy from an outside standpoint, but certainly with a sympathetic eye. He sincerely thanked them for the kind manner in which the address had been received.

Letters of Apology for Absence.

Mr. Secretary Naylor announced that letters of regret for non-attendance had been received from D. B. Dott, F.R.S.E. (Edinburgh); E. Dowzard, F.C.S. (Liverpool); F. R. Dudderidge, F.C.S. (Newcastle-on-Tyne); J. Harrison (Sunderland); H. W. Jones, F.R.M.S. (Coventry); Geo. Lunan (Edinburgh), N. H. Martin, J.P., F.L.S. (Newcastle-on-Tyne); J. C. C. Payne, J.P. (Belfast); Dr. Power (London); E. J. Parry, B.Sc. (London); W. J. Rankin (Belfast); Louis Siebold, F.I.C., F.C.S. (Manchester); J. F. Tocher, F.I.C., F.C.S. (Peterhead); T. Tyrer, F.I.C., F.C.S. (Stratford); W. F. Wells, jun. (Dublin); R. Wright, F.C.S. (Buxton).

Reception of Delegates.

Mr. W. A. H. Naylor (Hon. General Secretary) read the following list of delegates to the meeting:—

Pharmaceutical Society of Great Britain:—Mr. Newsholme (President), Mr. Allen (Vice-President), Mr. Atkins (Treasurer), Messrs. Carteighe, Cooper, Cross, Harrington, Harrison, Hills, Glyn-Jones, Johnston, Martindale, Symes, Wootton, and Young.

Pharmaceutical Society of Great Britain, North British Branch:—Mr. Peter Boa (Chairman), Mr. Robt. McAdam (Vice-Chairman), Messrs. Wm. Beaverly Cowie, Wm. Little Currie, Alex. Davidson, Jas. Laidlaw Ewing, Jonathan James Fraser, James Jack, John Johnston, Chas. Kerr, Andrew Naysmith, and David Storrar.

Pharmaceutical Society of Ireland:—Mr. G. D. Beggs (President), Mr. J. J. Bernard, (Vice-President), Professor C. R. C. Tichborne, Messrs. P. Kelly, and W. F. Wells.

Aberdeen Pharmaceutical Association:—Messrs. J. Cruickshank, W. Giles, J. Johnston, J. Paterson, and C. Simpson.

Bradford and District Chemists' Association:—J. Jackson and R. W. Silson.

Birmingham Midland Pharmaceutical Association :—Messrs. F. H. Alcock, G. H. Brunt, A. W. Gerrard, Jeffrey Poole, and C. Thompson.

Brighton Association of Pharmacy :—Messrs. C. G. Yates and W. W. Savage.

Bristol Pharmaceutical Association :—Messrs. H. E. Boorne, B. Keen, and G. T. Turner.

Cambridge Pharmaceutical Association :—Mr. B. S. Campkin (Hon. Secretary), Messrs. E. H. Church, A. Deck, E. S. Peck, R. Sturton.

Chemists' and Druggists' Society of Ireland :—Sir Jas. H. Haslett, M.P. (President), Messrs. Wm. Jamieson, and Samuel Gibson.

Dover Chemists' Association :—Mr. R. M. Ewell (Hon. Secretary).

Edinburgh Chemists' Assistants' and Apprentices' Association :—Dr. Coull, Messrs. W. Duncan, J. Rutherford Hill, and David McLaren.

Exeter Association of Chemists and Druggists :—Mr. H. Wippell Gadd.

Forfarshire and District Chemists' Association :—Messrs. A. B. Anderson, W. Cummings, A. Davidson, J. Jack, C. Kerr, A. Naysmith, and J. Russell.

Glasgow and West of Scotland Pharmaceutical Association :—Messrs. Robert Brodie, W. L. Currie, George Robertson, and David Watson.

Hull Chemists' Association :—Mr. Chas. B. Bell.

Leeds Chemists' Association :—Messrs. F. W. Branson, G. W. Worfolk.

Liverpool Chemists' Association :—Messrs. J. Alexander, J. Bain, A. S. Buck, R. C. Cowley, H. O. Dutton, E. Evans, jun., P. H. Marsden, J. Smith, T. H. Swinton, Charles Symes, and T. H. Wardleworth.

London Chemists' Assistants' Association :—Messrs. J. A. Dewhirst, F. W. Gamble, C. J. Strother, and T. M. Taylor.

London Western Chemists' Association :—Mr. H. J. Harrington (President), Mr. H. Cracknell (Vice-President).

Manchester Pharmaceutical Association :—Messrs. C. A. Johnstone, H. Kemp, William Kirkby, A. J. Pidd, and J. Wild.

Newcastle-on-Tyne and District Chemists' Association :—Messrs. Peter Bell, T. Maltby Clague, George Foggan, G. F. Merson, and J. D. Rose.

North-East Lancashire Chemists' Association :—Messrs. R. Lord Gifford and Cornwallis Shorrock.

Oxford and District Chemists' Association :—Messrs. G. C. Druce and H. Mathews.

Plymouth, Devonport, Stonehouse, and District Chemists' Association :—Mr. F. Maitland (President), Messrs. J. Barge, J. Cocks, F. W. Hunt, C. J. Park, J. Davey Turney, and W. H. Woods.

Sheffield Pharmaceutical and Chemical Society :—Mr. George Squire (President), Messrs. A. R. Fox, G. T. W. Newsholme, and J. B. Pater.

Sunderland Chemists' Association :—Messrs. J. Hutchinson, C. Rankin, and R. Robinson.

Swansea and District Chemists' Association :—Messrs. N. M. Grose and J. Hughes.

Report of the Executive Committee.

Mr. F. Ransom (Hon. Gen. Sec.) then read the following :—

Your Committee has pleasure in presenting the Thirty-seventh Annual Report of the work carried out by the Executive during the past year.

During this period special efforts have been made to increase the membership, and as a result 137 candidates have been elected, as compared with 74 during the previous year. This apparent increase has, however, been nearly neutralised by various causes. Twenty-two members have been removed by death, sixteen have resigned, whilst the names of ninety-four have been deleted on account of their subscriptions being four years in arrear. The net increase in membership is consequently only five. It follows that the unsatisfactory financial position of the Conference report last year is now still more unsatisfactory. The deficit last year was £25 18*s.* 5*d.*; it is now £54 16*s.* 2*d.* Unless a strong effort is made to arrest this increase in our liabilities it will be impossible to maintain the good work of the Conference.

It is much to be regretted that so many members have been lost through their seeming lack of interest in the Conference, and it is hoped that the local corresponding secretaries, who have given freely of their time and energy, will continue to assist the Executive not only in obtaining new subscribers, but also in their endeavour to retain as members those whose subscriptions are in arrear.

The "Blue List," which it has been customary to send to each

member, has been discontinued in that form, and in its place a "Research List" has been compiled, which, by the courtesy of the respective editors, has been published in full in the principal journals connected with pharmacy in this country. By this change some economy has been effected, and it is thought that the list will be as readily accessible as hitherto to all members to whom it has proved useful in suggesting subjects requiring investigation.

Mr. Louis Siebold, F.I.C., F.C.S., has been re-appointed Editor of the *Year-Book*, and the MS. of parts 1 to 3 is already in the hands of the printers.

Mr. Ernest J. Parry, B.Sc., will report to the present meeting the results of his examination of santal-wood oil. To assist him in carrying out this research the Conference a year and a half ago granted him the sum of five pounds. In order to further encourage the promotion of pharmaceutical research, your Committee has had under consideration the proposal to raise a fund for the purpose of maintaining a qualified chemist, who shall devote his whole time to the prosecution of work directly connected with pharmacy. Annual subscriptions for at least three years, amounting to ninety guineas, have already been promised in support of the scheme.

Your Committee has received with much regret the resignation by Mr. J. C. Nightingale of his position as Assistant Secretary, a post which he has occupied with credit for the past seven years. On account of failing eyesight he finds it impossible to continue his duties, and Mr. John Hearn has been temporarily appointed to fill the vacancy.

The death-roll during the past year has been unusually heavy, and your Committee has to deplore the loss of no fewer than four Vice-Presidents. Richard Reynolds, of Leeds, was one of the founders of the British Pharmaceutical Conference. In conjunction with Professor Attfield he was appointed Honorary Secretary at its inauguration in 1863, and continued in office until 1871. In 1880 he accepted the presidency, and acted in this capacity at the meeting at York in the following year. The services rendered by Richard Reynolds were, however, by no means confined to the duties performed in his official positions. The keen interest he invariably showed in all matters relating to the welfare of the Conference, the able papers he contributed, the valuable part which he took in the discussions, and, not least, his genial personality, have added much to the success of our meetings. Your Committee has also to record the death of Thomas Greenish,

who ably presided at the Birmingham meeting of 1886, and that of E. C. Cortis Stanford, who filled the same office at Edinburgh in 1892. Each of these gentlemen, in their separate spheres—the one as a distinguished pharmacist, the other as a prominent industrial chemist—contributed generously and richly to the scientific literature of the Conference.

R. J. Downes was elected to the Vice-Presidency at Belfast in 1898, a position he continued to hold until his death, a few months since. T. M. Wilkinson, of Dunedin, had for many years served the Conference as Honorary Colonial Secretary for New Zealand.

In addition, a distinguished honorary member has passed away in the person of Dr. Anton von Waldheim, of Vienna.

As the intended last line of the report is penned the journals announce the death of the accomplished pharmacist and eminent botanist John Borland. Although he did not make at any time a formal communication to the Conference, he served as a member of Committee, attended for many years the annual meetings, and never joined in a discussion without imparting some useful information. Among the qualities which characterised him were a quiet dignity, a thoughtful mind, a conciliatory disposition, and a whole-hearted devotion to his life's work. He has gone to his rest full of years and rich in the esteem of his fellow pharmacists.

Mr. J. C. Umney (Hon. Treasurer), in presenting the financial statement, said the deficit amounted to £54 16*s.* 2*d.*, which was very unsatisfactory. He had to report, however, that arrangements were being made by the Committee for so enhancing the value of the *Year-Book* as to make it of greater value as an advertising medium, and that in that way the income might be increased. Reference was made in the report to the efforts of local secretaries to obtain new members, and to the large number of accessions during the year; but, unfortunately, there had been also many losses, and the Committee would esteem it a favour if every member would make it his business during the coming year to get at least one new member, so that next year they might be in a better position, and that by the next year, at any rate, they might have a balance on the right side.

Financial Statement for the year ending June 30th, 1900.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1899.	Dr.	£ s. d.	£ s. d.
July 1.	To Assets forward from last year—		
„	„ Cash in Secretary's hands—		
„	Petty Cash	1 4 9	
„	Postages	0 0 6	
„	„ Cash at Bank	104 18 8	
			106 3 11
„	„ Sales of *Year-Book* by Publishers . .		14 0 0
„	„ Advertisements, 1898 vol. . .	1 2 0	
„	„ „ 1899 vol. . .	73 1 2	
			74 3 2
„	„ Sales of *Unofficial Formulary* by Publishers		0 9 0
„	„ Members' Subscriptions—		
	From July 1, 1899, to June 30, 1900.		370 0 7
„	„ Liabilities on Open Accounts—		
	Butler & Tanner 150 10 9		
	Do. . 16 5 11		
		166 16 8	
	McCorquodale & Co., Ltd. .	5 3 0	
			171 19 8
„	„ Assistant Secretary's Salary and Rent, April 1 to June 30, 1900 . .	—	13 15 0
			750 11 4

1899.	Cr.	£ s. d.	£ s. d.
June 30.	By Expenses of *Year-Book*—		
	Printing, Publishing, and Binding	195 17 10	
	Banding and Parcelling . .	3 11 11	
	Postage and Distributing—		
	1898/1899 . . £7 9 6		
	1899/1900 . . 16 5 11		
		23 15 5	
	Advertising, Publishers' Charges, and Commission . . .	20 0 10	
	Editor's Salary . . .	150 0 0	
	Foreign Journals for Editor .	6 0 6	
			399 6 6
„	„ *Unofficial Formulary*:—		
	Publishers' Charges		0 0 11
„	„ Sundry Expenses:—		
	Copies of President's Address .	1 1 0	
	Assistant Secretary at Plymouth Meeting	10 0 0	
			11 1 0

1899.	Cr.	£	s.	d.	£	s.	d.
June 30.	By Assistant Secretary's Salary :—						
	From July 1, 1899, to June 30, 1900	45	0	0			
	Rent of office	10	0	0			
					55	0	0
,,	,, Postages	14	8	0			
,,	,, Printing and Stationery :—						
	Prince & Baugh	£1 10	6				
	McCorquodale	5 16	0				
	,,	5 3	0				
	Keys	1 2	6				
		16	12	0			
,,	,, Petty Cash expended	4	16	8			
,,	,, Bank Charges, 1*d.*, 1*d.*, 3*d.*	0	0	5			
					35	17	1
,,	,, Liabilities of last year, since paid :—						
	Butler & Tanner	103	11	10			
	McCorquodale & Co.	8	15	0			
	David Nutt	6	0	6			
					118	7	4
	Assistant Secretary's Salary and Rent				13	15	0
,,	,, Cash in Secretary's hands :—						
	Petty Cash	1	8	1			
	Postages	1	14	6			
,,	,, Cash at Bank (as Pass Book)	114	0	11	117	3	6
					£750	11	4

The Bell and Hills Fund.

1899.		£	s.	d.	£	s.	d.
July 1.	To Balance on hand	18	13	6			
1900.							
June 30.	,, One year's Dividend on Consols	9	11	8			
1899.					28	5	2
July 15.	By Purchase of Books for Plymouth (H. Kimpton)				9	1	9
					£19	3	5

Assets :—

Cash Balance at Bank (as Pass Book)	19	3	5
£360 2¾ Consolidated Stock Scrip	360	0	0

Examined and found correct.

F. MAITLAND, Stonehouse,
J. H. MATHEWS, London, } *Auditors.*

July, 1900.

Mr. BRIDGE moved the adoption of the report and financial statement, but did not like the suggestion that advertisements should be added to the *Year-Book*, which he thought would be much better without them. If they could make the accounts balance without getting advertisements it would be much more to their credit. He would do his best to get some extra members before next year.

Mr. W. G. CROSS, in seconding the motion, said he agreed very largely with the remarks just made with regard to advertisements, but unfortunately he feared it was a necessity in these days. If the income could be raised from new members it would be more satisfactory, and he would do all he could in that direction, and trusted other members would do the same.

Dr. ATTFIELD said he had heard similar speeches to those just made for the last twenty-eight years. In 1872, when Secretary, he was strongly opposed to the introduction of advertisements into the *Year-Book*, and for some years the members loyally endeavoured to do what had been suggested, and year by year the Executive had begged the existing members to enable them to do without advertisements, and he did not think there was a member of the Executive but would agree with the opinions expressed, but, unfortunately, in spite of all efforts, the desired result was not attained. In the early years of the Conference the numbers went on increasing until they reached three thousand, but since then they had decreased, and they could not blind themselves to the fact that if they were to live they must make the *Year-Book* so attractive to druggists generally that it would become a valuable medium for advertisers.

The PRESIDENT, in putting the motion, said he agreed with the previous speakers, but whilst they all admired the ideal they had to deal with the practical. Experience had shown that although they got a large addition to their numbers, they lost an almost equal number, many only joining for one year when the Conference met in their particular locality. He suggested that members should send in their subscriptions three years in advance, which would put the Executive in funds.

The motion was then carried unanimously.

REPORT OF THE FORMULARY COMMITTEE.

Mr. NAYLOR (Hon. Secretary) then read the following report of this Committee:—

It is six years since the last edition of the Conference Formulary

was published, and members may reasonably ask for an explanation of the delay. Up to 1898 the reason is given in the reports of the Committee, viz., that as the publication of a new Pharmacopœia was imminent and some of the members of the Formulary Committee were also members of the Pharmacopœia Committee, it was deemed desirable that the work of the former committee should remain in abeyance until the Pharmacopœia was published. During 1899 a certain amount of preliminary work was done by correspondence, but this was delayed in part by the amount of work which devolved on the Chairman, as President of the Pharmaceutical Society, and in part by the expectation of further addenda to the Pharmacopœia. At the last annual meeting Mr. Martindale formally withdrew from the chairmanship, and the Committee desires to place on record its high appreciation of the valuable services he has rendered during the long period he has been chairman. At the first meeting of the Committee held at Bloomsbury Square, on December 6, the present chairman, who has been a member of the Committee since its formation, was elected, and a provisional list of preparations, suggested by the various members of the Committee, was adopted. At this meeting Mr. Peter Boa, of Edinburgh, and Mr. H. Wilson, of Southampton, were added to the Committee. Subsequent meetings have been held on March 7 and June 13, when specimens of various preparations were exhibited and the formulæ fully discussed, with the result that, in addition to certain modifications in one or two old formulæ which were not quite satisfactory, about a score of the new formulæ have been adopted, and a number of others are undergoing further trial. The Committee could have presented these at the present Conference, but it was thought that it would be more satisfactory to make the list as complete as possible and to endeavour to include in it formulæ for as many as can be included of the preparations which are commonly prescribed, so as to secure that "uniformity in composition and strength in non-official remedies" which was the great desideratum in the appointment of the Formulary Committee. With this object the Chairman and Secretary of the Committee will be glad if members of the Conference will send them information as to the preparations which are in frequent use, but for which no standard formulæ have been published. As the Formulary has always been published in pamphlet form, the Committee, if reappointed, will apply to the Executive for permission to do this as soon as their labours are complete. They anticipate this will be towards the close of the present year. The Committee

also suggest that in future the word "unofficial" be deleted from the title of the Formulary, as the words British Pharmaceutical Conference are sufficient to safeguard it from being mistaken for the Pharmacopœia, and a misapprehension of the word "unofficial" in this connection might leave the impression that the Formulary was not the official statement of the British Pharmaceutical Conference.

The Committee cannot close this report without reference to the great loss which the Conference and pharmacy have sustained by the deaths of Mr. Reynolds and Mr. Greenish. It was due to the initiative of the former, as an outcome of the presidential address of the latter at the Birmingham meeting of the Conference in 1886, that this Committee was appointed, and both were members of the Committee for many years and rendered valuable assistance to it.

July 20, 1900. N. H. MARTIN, Chairman.

Mr. J. C. UMNEY moved the adoption of the report, which was seconded by Mr. MARTINDALE, and carried unanimously.

The reading and discussion of papers was then proceeded with.

In the absence of the author, Mr. NAYLOR read the following:—

NOTES ON SANTAL-WOOD OIL.

By ERNEST J. PARRY, B.Sc., F.I.C.

Since I published a paper on this interesting oil a few years ago, showing that it consisted in the main of bodies of an alcoholic nature, and not of aldehydes, as Chapoteaut had previously stated, several chemists have devoted themselves to the subject, notably Guerbet, Soden, and Müller, and Messrs. Schimmel & Co.'s chemists. Owing to frequent interruption my work has been exceedingly slow, and although the results I have obtained differ in a few details from some of those recorded by the above-named chemists, they are in the main in agreement with them. Were it not for the fact that this was a promised report for the Conference, I should not have published these results, and in doing so, although practically all my results were obtained independently, I wish it to be distinctly understood that I make none of those absurd claims to priority which are so common amongst some Continental chemists under similar circumstances. The main result at which I have

arrived is that the so-called santalol, which I previously showed existed to the extent of about 90 per cent. in santal-wood oil, is a mixture of two, and possibly more, bodies of an alcoholic nature. This result is in agreement with that of all the chemists quoted above. The method of separating the alcohols used was that of Haller (*Comptes Rendus*, cviii. p. 1308) for preparing certain terpene alcohols. This was also the process adopted by Guerbet. The oil was distilled three times under a pressure of about 28–30 mm., and finally separated into two chief fractions: (1) boiling at 112 to 160°; (2) boiling at 160 to 205°.

Fraction 1 was very small, about 20 c.c. from 2,000 c.c. of oil. The specific gravity of this fraction was 0·930, and the optical rotation −24° 30′. It darkened considerably on treatment with metallic sodium, and when distilled under ordinary pressure from this metal yielded about half (11 c.c.) of a light oil of specific gravity 0·919 and optical rotation −22° 15′. This is undoubtedly the hydrocarbon (or hydrocarbons) which Soden announced under the name of santalene, but neither he nor Guerbet have proved the purity of either the α- or the β-santalene into which the latter chemist claims to have separated the hydrocarbon. I may mention that specimens of about 200 c.c. of liquids, labelled α-santalene and β-santalene, are exhibited in the German section of the Paris Exposition.

Fraction 2 was heated with its own weight of phthalic anhydride to 120–150° for three hours. The resulting acid phthalic esters were dissolved in caustic potash solution, which was then treated with ether to extract neutral bodies, if present. The esters separated by acidification were saponified, and the alkaline liquid separated after dilution. The oil, consisting of the alcohols, was then separated, dried over potassium bisulphate, and filtered. It was a pale yellow oil, of specific gravity 0·981 and optical rotation −27° 10′. I have not succeeded in separating this oil into any body which can be shown to be a pure individual. On fractionation under reduced pressure (35 mm.) 300 c.c. yielded the following fractions:—

		Sp. Gr.	Rotation.
180–185° ...	28 c.c. ...	0·976 ...	− 6° 40′
185–190° ...	42 c.c. ...	0·978 ...	− 9° 10′
190–195° ...	80 c.c. ...	0·9785 ...	−16° 23′
195–100° ...	77 c.c. ...	0·9799 ...	−22°
200–205° ...	42 c.c. ...	0·9824 ...	−29° 6′
Not distilled	31 c.c. ...	— ...	—

All that these results can be said to show is that the "alcohol"

is of a complex nature, and neither these nor Guerbet's, Schimmel's, or Soden and Müller's results can be said to have shown what are the characters of any pure chemical compound from the alcoholic mixture. When santal-wood oil (or its alcoholic constituents) is mixed with phenylisocyanate, a marked rise in temperature occurs, and the liquid gradually becomes semi-solid. I have separated from this semi-solid mass, by washing with petroleum ether and recrystallising the dried mass from 80 per cent. alcohol, a crystalline compound melting at 237° (uncorrected). This is probably a phenylmethane of one of the alcohols present in the oil. Schimmel & Co. have suggested that it is merely diphenyl urea, but the course of the reaction does not indicate this, as it is hardly probable that phenyl isocyanate would abstract water from these alcohols so readily, which would be necessary for the formation of diphenyl urea. I have not yet, however, had the opportunity of further examining this body.

The PRESIDENT said there was a large demand for this oil. One of the great difficulties attendant on the examination of essential oils was that when distilled, unless the various sections were bulked, you got very different results from different portions.

A vote of thanks was given to Mr. Parry for his paper.

The next paper was read by Dr. H. A. D. Jowett :—

SOME OBSERVATIONS AND SUGGESTIONS RELATING TO THE CHEMISTRY OF THE BRITISH PHARMACOPŒIA.

By FREDERICK B. POWER, PH.D.

The appearance of a new national Pharmacopœia is always an event of considerable interest, for it may reasonably be assumed that it will reflect, so far as is practicable in a work of that character, the progress in the sciences relating to pharmacy and medicine during the period that has elapsed since its last preceding revision. The importance of a new edition of such a work is manifest when it is considered how large a circle it concerns, inasmuch as it is designed to represent a standard to which medical men, pharmacists, public analysts, and chemical or pharmaceutical manufacturers are expected to conform.

It is therefore natural, and, indeed, desirable, that the appearance of a new national Pharmacopœia should be attended by some

expressions of opinion on the part of those who are interested in it, and whose work, to a greater or less extent, is affected by it; for even a work that is issued *By Authority* can hardly be expected to be perfectly free from errors and defects, however much care may have been bestowed on its compilation.

The comments that immediately follow the publication of such a work, in so far as they represent only first impressions, are apt to be somewhat superficial in their character, and therefore as likely to err in bestowing unqualified praise as in the severity of the criticisms. On the other hand, there are also from time to time some facts brought to notice which possess positive and lasting value, and are therefore worthy of careful consideration. These may relate either to actual errors in the text, to the impracticability of particular requirements, or to suggestions for further improvements in descriptions or processes.

The Committee of Revision of the United States Pharmacopœia have long recognised the value of such observations or criticisms, and have taken pains to collate them from every available source during the intervals of the last two revisions, or for a period of nearly twenty years. Under the title, *Digest of Criticisms*, they have been published and issued gratuitously by the Committee to the medical and pharmaceutical societies and colleges immediately concerned, and to all those, either at home or abroad, who were supposed to be specially interested in the work. It will be evident that by the adoption of this plan considerable aid is given to those upon whom the preparation of a subsequent edition of the United States Pharmacopœia depends, even though but a comparatively small part of the collected material may be eventually utilised.

Although the chemistry of the British Pharmacopœia has already received some consideration at the hands of the critics,[1] the published papers and discussions relating thereto have been somewhat fragmentary, and no attempt appears to have been made to subject it to a more complete and systematic review.

More than two years have now elapsed since the appearance of the work, and it has therefore seemed desirable to indicate some errors which appear to have escaped notice, or to which at least attention has not yet been directed. In addition to these, it has

[1] *Year-Book of Pharmacy*, 1898, pp. 452, 456, 467; *Pharmaceutical Journal*, 1898, **60**, p. 394, **61**, pp. 666, 684; *Chemist and Druggist*, 1898, **52**, p. 674, **53**, p. 348; *British and Colonial Druggist*, 1898, **33**, p. 515, **34**, pp. 107, 515, 719, 1899, **35**, p. 160.

been thought useful to incorporate references to some previously published observations, either for the purpose of further confirming them or for other comments, as also for the sake of completeness. It may likewise be stated that the criticisms made by the writer relating to the officially described characters or tests of individual chemicals have been, so far as possible, substantiated by experiment, even in cases where incorrectness of statement has been so obvious as seemingly not to require it. By the inclusion of such experimental work it has been the aim to impart to the criticisms a constructive character.

It is in this broad spirit, but entirely on his own initiative and responsibility, that the writer has undertaken to present the following observations on the chemistry of the British Pharmacopœia, and it is hoped that they may contribute in some degree to its perfection and usefulness.

Acetanilide.

The text of this chemical, which is first in the list of the Pharmacopœia,[1] contains some errors of a particularly interesting character. It is stated, for example, that "on boiling with *test-solution of ferric chloride* a reddish-brown colour is produced, and this is almost entirely discharged by hydrochloric acid." The well-known fact appears to have been overlooked that test-solution of ferric chloride alone becomes reddish-brown on boiling, owing to the formation of a basic salt, although if the solution is sufficiently dilute it may remain perfectly clear (compare Schmidt, *Pharm. Chemie*, 3rd ed., vol. i. p. 764). The Swiss Pharmacopœia (*Editio tertia*), 1893, strangely enough, contains the same error, since it states: "The aqueous solution of antifebrin affords, on boiling with a few drops of ferric chloride, a dark brown-red colour, and on the addition of hydrochloric acid again becomes pale yellow." If this test be made with a cold saturated aqueous solution of antifebrin, and also with distilled water to which the same amount of solution of ferric chloride has been added, there is practically no difference whatever in the shade of colour of the two liquids after boiling, and precisely the same yellow colour is produced in both on the subsequent addition of hydrochloric acid. The conclusion must be that this test has been formulated by some one who was not familiar with the change of colour produced in a solution of ferric chloride on boiling. In this connection attention may also be

[1] Whenever in the following notes the Pharmacopœia is cited, the British Pharmacopœia is intended.

called to the official *test-solution of ferric chloride*, p. 415, which is directed to be made from *commercial anhydrous* ferric chloride. The questions arise whether there is any anhydrous ferric chloride except the commercial, and, furthermore, whether the anhydrous salt is really intended to be used. The ordinary commercial ferric chloride, occurring in crystalline masses, is, of course, not anhydrous, but has the composition $Fe_2Cl_6 \cdot 12H_2O$. In ordering the anhydrous salt from one of the large London dealers in chemicals, the writer was informed that it would be necessary to send to the Continent for it. It is also not obvious what advantage there can be in the use of the anhydrous salt for the purposes of a test-solution of ferric chloride, as it requires to be dissolved in water, and it costs about ten times the price of the ordinary crystallised salt.

Another most peculiar error in the text for acetanilide is included in the following statement: "A cold saturated aqueous solution . . . is not affected by test-solution of ferric chloride (absence of *acetone*, etc.)." It would be somewhat surprising in the first place if dry, crystallised acetanilide should be capable of containing as an impurity such a very volatile liquid as acetone, for experiment has shown that even when crystallised from the latter it does not combine with it, and furthermore acetone gives no very specific reaction with ferric chloride. A cold saturated aqueous solution of acetanilide which had been freshly crystallised from acetone was prepared, and, as was to be expected, this was no more affected by ferric chloride than an equal volume of distilled water, and even considerable acetone may be added to such a solution without any visible change. In fact, pure acetone gives but a faint yellowish colour with ferric chloride, not at all comparable in intensity, for example, to the colour afforded by absolute alcohol. This test for acetone appears, moreover, to be based upon a misinterpretation of Gerhardt's test for the detection of acetone in urine (see also *Pharm. Journ.*, April, 1899, p. 387). It does not really detect acetone, or, at least, only indirectly, but rather the so-called ethyl diacetic acid, now known as ethyl aceto-acetate, $C_6H_{10}O_3$ or $CH_3 - CO - CH_2 - CO_2C_2H_5$, which gives a purple colour with ferric chloride. Thus it is stated in Neubauer and Vogel's *Analysis of the Urine*, American, from the seventh German edition, New York, 1879, p. 158, "Gerhardt first laid stress on the fact that a diabetic urine in which acetone is contained or *formed* is at the same time characterised by a remarkable reaction, namely, treated with ferric chloride, a deep

red-brown colour is produced. This reaction corresponds with the demeanour of ethyl diacetic acid discovered by Geuther, *which decomposes with great readiness into acetone*, alcohol and carbonic acid."

For some remarks on the detection of *phenacetin* in acetanilide see *Pharm. Journ.*, April, 1899, pp. 367, 402.

Glacial Acetic Acid.

Mr. J. C. Umney (*Pharm. Journ.*, August, 1898, p. 242, and January, 1900, p. 8) has noted a discrepancy between the required strength and the melting point of this acid.

Arsenious Acid.

Although from long usage the title *acidum arseniosum* (arsenious acid) may not be considered incorrect, the writer would prefer that of *acidum arsenosum* (arsenous acid), as adopted by the U.S. Pharmacopœia, and which corresponds to the analogous phosphorous acid. It would also conform with the change in nomenclature adopted by the Pharmacopœia from sodium arseniate to sodium arsenate (*sodii arsenas*), and from ferri arsenias to *ferri arsenas*.

Benzoic Acid.

This is stated to be "obtained from benzoin by sublimation," but it is also obtained from benzoin, and probably much more largely, in the wet way, by the lime method. It is probably not intended to exclude the latter product, since the Pharmacopœia permits the acid to be obtained from toluene and other compounds. The German and Swiss Pharmacopœias restrict the benzoic acid to that obtained from benzoin by sublimation, whereas the French Codex, under a distinct title, also recognises that prepared from benzoin in the wet way.

Boric Acid.

The synonym, *hydrogen borate*, has been criticised as being somewhat out of place in a Pharmacopœia, especially as no corresponding synonym is given for any of the other acids. The statement that "boric acid *liquefies when warmed*, and on *careful heating* loses 43·6 per cent. of its weight," is extremely vague, and gives a very incorrect idea of its behaviour. As stated in the United States Pharmacopœia and in chemical text-books, and as more recently noted by E. Merck (*Chemist and Druggist*, August,

1898, p. 349), when boric acid is heated to 100° C. it is converted into metaboric acid, HBO_2, which slowly volatilises at that temperature. The metaboric acid fuses at 160° C., by prolonged heating at the latter temperature tetraboric acid, $H_2B_4O_7$, is formed, and it is only by strong ignition that boron trioxide or sesquioxide, B_2O_3, is obtained, which is the compound corresponding to the loss of weight indicated by the Pharmacopœia as produced on careful heating.

Citric Acid.

David Howard (*Chemist and Druggist*, April, 1898, p. 675) has called attention to the unsatisfactory character of the Pharmacopœia tests for lead in citric and tartaric acids. He notes that by requiring the acid to be neutralised with solution of ammonia, if the exact point of neutrality is passed, a dark coloration with hydrogen sulphide may be caused by the presence of traces of iron as well as of *lead*. The United States, German and Swiss Pharmacopœias avoid the possibility of such a mistake by directing the acid to be only partially or approximately neutralised with ammonia.

Gallic Acid.

The Pharmacopœia states that the aqueous solution of this acid is not precipitated by *tartarated antimony* (showing absence of tannic acid). This is an error which has previously been noticed by both Dr. Sillar and D. B. Dott (*Pharm. Journ.*, Dec., 1898, p. 684, and Jan., 1899, p. 58), and it is somewhat strange that it should also appear in the Swiss Pharmacopœia. If, for example, to 1 c.c. of an aqueous solution of gallic acid 5 c.c. of a saturated aqueous solution of tartarated antimony be added, a white precipitate is soon formed, and the filtered liquid then affords but a very slight reaction with ferric chloride, thus proving that the gallic acid is quite completely precipitated. The above incorrect statement has also been copied into Hager's *Handbuch*. Beilstein (*Handbuch der Organischen Chemie*, Bd. ii. p. 1920) mentions a gallate of antimony, of uncertain composition, as an *insoluble precipitate*.

Hydrobromic Acid.

A new and most excellent method for preparing this acid in a pure state has recently been published by Dr. A. Scott, F.R.S. (*Journ. Chem. Soc.*, 1900, p. 648).

Phosphoric Acid.

The Pharmacopœia states that this "may be prepared by treating with water and nitric acid *the residue left after burning phosphorus in air.*" This is not quite correctly expressed, since it is not the *residue* left after burning phosphorus, but the *product of its combustion* in the air, from which phosphoric acid may be prepared.

Salicylic Acid.

The Pharmacopœia states that the crystals "below 392° F. (200° C.) volatilise without decomposition." This might be made a little more exact, as salicylic acid sublimes slowly at the temperature of a water-bath (about 100° C.).

Sulphuric Acid.

Schlagdenhauffen and Pagel (*Apoth. Zeit.*, 1900, No. 36, p. 302, from *Journ. de Pharm. et de Chim.*) have recently noted the frequent occurrence of *selenium* in sulphuric acid, as out of twelve samples supplied as "chemically pure" only three were found to be free from this contamination. They identified it by means of Dragendorff's codeine reaction, which consists in bringing a little codeine in contact with five or six drops of sulphuric acid containing selenium, when at ordinary temperatures the liquid soon assumes a green colour. This reaction is of interest, as codeine is stated to form a colourless solution with sulphuric acid, and it does so when the latter is pure, but, as stated in Flückiger's *Reactions* (English translation), p. 38, "frequently the reaction fails and the acid turns somewhat green." The frequent occurrence of selenium in the acid would appear to explain this result. In two samples of English acid tested by the writer this reaction was not obtained, a chemically pure acid giving a colourless solution with codeine, and a so-called commercial acid producing only a faint rose-tint.

Tannic Acid.

Under this title the Pharmacopœia makes the following remarkable statement:—"Tannic acid, $C_{14}H_{10}O_9$, $2H_2O$, may be extracted by water-saturated ether from galls *which have been subjected to a special fermentation.*" In the first place it seemed very strange to the writer that tannic acid should contain two molecules or any definite amount of water, considering the method of its preparation. In order to ascertain what authority there could be for such

a statement, a search was made through the literature of the subject, including such standard works as Beilstein's *Handbuch der Org. Chemie*, Thorpe's *Dictionary of Applied Chemistry*, Husemann's *Die Pflanzenstoffe*, both Schmidt and Flückiger's *Pharm. Chemie*, and a number of others, but in all of these the formula is given simply as $C_{14}H_{10}O_9$, and no mention whatever is made of any combined water. It was only in Richter's *Organic Chemistry*, vol. ii. p. 231, that its formula with two molecules of water could be found. The statement is obviously incorrect, and the only explanation that appears at all probable is that the Pharmacopœia authorities have confused tannic acid with the β-digallic acid of Böttinger, which has been assigned the formula $C_{14}H_{10}O_9 + 2H_2O$ (compare Beilstein's *Handbuch der Org. Chemie*, Bd. ii. p. 1925, and *Berichte des Deutsch. Chem. Ges.*, 17, p. 1476). Böttinger expressly stated, however, that this substance, although resembling tannin, is not identical with it, inasmuch as on boiling with dilute sulphuric acid it is not converted into gallic acid. It was obtained by heating the ethyl ester of gallic acid with pyroracemic acid (or glyoxylic acid) and sulphuric acid. The α-digallic acid of Schiff (Beilstein, *loc. cit.*, p. 1924) was obtained by heating gallic acid with phosphorus oxychloride. It has the formula, $C_{14}H_{10}O_9$, *contains no water*, and has all the properties of tannin.

The writer is also not aware that in the preparation of tannic acid the galls are "*subjected to a special fermentation.*" All the text-books at least indicate that the tannin is directly extracted from powdered galls by suitable solvents. On the other hand, it is well known that gallic acid may be prepared by the hydrolysis of tannic acid, and that this change may be effected by a ferment as well as by boiling with a dilute acid or alkali (compare Thorpe's *Dictionary*, vol. iii. p. 775).

Aconitine.

As the Pharmacopœia aims to be conservative as well as authoritative, it seems somewhat questionable whether a formula should be assigned to this alkaloid, which even the author of it did not consider definitely established. In some Continental works, as, for example, in Hager's *Handbuch*, Bd. i. p. 147, the slightly different formula of Freund, $C_{34}H_{47}NO_{11}$, seems to be preferred. (Compare also *Pharm. Journ.*, vol. lx., 1898, p. 394.)

The description, "colourless hexagonal prisms of the rhombic system," would appear to pertain to a specially prepared specimen, and not to the alkaloid as it occurs in commerce, which might be

more correctly described as *indistinct crystals, or a crystalline powder*. The statement that "an alcoholic solution of the alkaloid turns the plane of a ray of polarised light to the right" (a somewhat cumbersome phrase for indicating that it is optically dextrogyrate), would seem to be of very little value unless the degree of rotation is given, for it assures neither the identity nor the purity of the alkaloid.

Amyl Nitrite.

In the text of this article there occurs the following sentence: —"Submitted to distillation, about 70 per cent. passes over between 194° and 212° F. (90° and 100° C.), the bulb of the thermometer not dipping below the surface of the *residual fluid*." It is not clear why the word *residual* is inserted here, as the only residual fluid would be that portion remaining after distillation between the limits of temperature mentioned, when the thermometer is no longer required. The bulb of the thermometer should not at any time dip below the surface of the liquid.

Atropine.

For some comments on the Pharmacopœia text for atropine and atropine sulphate, as also for hyoscine hydrobromide and hyoscyamine sulphate, see "A Note on the Mydriatic Alkaloids," by Dr. H. A. D. Jowett (*Pharm. Journ.*, Aug., 1898, p. 195), and "Some New Gold Salts of Hyoscine, Hyoscyamine, and Atropine," by the same author (*Journ. Chem. Soc.*, 1897, p. 679).

Bismuth Carbonate.

In conformity with the official title of bismuth oxynitrate the title of this salt would be more correctly *bismuthi subcarbonas*. As it is so well known that the oxy-salts of bismuth are not of constant composition, it seems quite inexplicable that the Pharmacopœia should assign to both the oxycarbonate and the oxynitrate definite formulas, and require them to yield amounts of bismuth sulphide exactly corresponding to these formulas. These thoroughly impractical requirements for the official bismuth preparations have been criticised by both David Howard and E. Merck (*Chemist and Druggist*, April, 1898, p. 674, and Aug., 1898, p. 348). The official method of determining the bismuth in these compounds as sulphide is not one that commends itself, and E. Merck (*loc. cit.*) has given figures obtained by himself which prove that the determination as oxide is more accurate and reliable

as well as very much more rapid. The absence of non-volatile impurities would, of course, be determined by the usual qualitative tests, and if these were present in any amount a quantitative determination of the bismuth would rarely be required. The variation in composition of these salts is apparent by a comparison of the requirements of some of the Pharmacopœias, as expressed in percentages of bismuth oxide.

Bismuth Subcarbonate.—B.P., 89·7 per cent.; U.S.P., 87–91 per cent.; Ph. Germ. Supp., at least 85 per cent. Bi_2O_3.

Bismuth Subnitrate.—B.P., 76·3 per cent.; U.S.P., 79–82 per cent.; Ph. Germ., 79–82 per cent.; Ph. Helv., about 80 per cent. Bi_2O_3. Compare also Thoms (*Apoth. Zeit.*, 1898, p. 318).

Bismuth Salicylate.

The Pharmacopœia text for this salt has already received considerable adverse criticism (see E. Merck, *Chemist and Druggist*, Aug., 1898, p. 348; D. Lloyd Howard, *Pharm. Journ.*, Aug., 1898, p. 233). The requirement that alcohol when shaken with the salt shall not give a violet colour with ferric chloride, can hardly have been based on actual observation. The writer has never seen a specimen of the salt, either as found in commerce or however carefully prepared, that would stand this test, and it cannot be expected that it should in view of the extreme facility with which these basic salts become dissociated. There is also an inconsistency in requiring that the salt shall yield very nearly the theoretical amount of bismuth sulphide—70 per cent. (theory requires 71 per cent.), whereas a limit of 2 per cent. (62–64) is permitted in the more accurate determination as oxide. The theoretical amount of oxide is 64·3 per cent., but the salt is likely to be somewhat more basic, and therefore to afford a little higher percentage of oxide. Several commercial specimens examined by the writer have been found to afford 65–66 per cent. of bismuth oxide, and a very carefully prepared specimen gave 64·7 per cent. on ignition. It is difficult to harmonise the requirements that the salt should afford 62 to 64 per cent. of oxide, and at the same time give no reaction for free salicylic acid, when theoretically any smaller proportion of oxide than 64·3 per cent. would necessarily indicate the presence of a corresponding amount of free salicylic acid, assuming the absence of other impurities.

For the examination of bismuth salicylate it will usually be found sufficient, in connection with qualitative tests, to determine the amount of oxide afforded by ignition. Some methods have

been proposed, however, which include the determination of the amount of salicylic acid in the salt, or are based upon the determination of the acid radical alone. It was thought of interest to compare the accuracy of these methods, and for this purpose one of the above-mentioned specimens of bismuth salicylate was employed, which afforded 64·7 per cent. of oxide on ignition.

(1) Kollo (*Proc. Amer. Pharm. Assoc.*, 1899, p. 719, from *Pharm. Post*, 1899) recommends heating the bismuth salicylate with a normal solution of potassium hydrate, collecting, drying, and weighing the bismuth hydroxide formed, and calculating it as oxide. The salicylic acid is determined in the filtrate and washings by titrating with normal hydrochloric acid, using phenolphthalein as an indicator.

(*a*) 1·9264 gramme of the salt treated in this manner gave of Bi O (O H), dried at 95° C., 1·2710 gramme = 63·52 per cent. Bi_2O_3. This precipitate, however, after ignition, weighed 1·2390 gramme, corresponding to 64·33 per cent. Bi_2O_3. The filtrate from the bismuth hydroxide gave on titration a result indicating 40·8 per cent. $C_6H_4 \cdot OH \cdot COOH$.

(*b*) 1·8530 gramme of the salt gave 1·2095 gramme of bismuth hydroxide = 62·83 per cent. Bi_2O_3, and by titration of the filtrate 41·7 per cent. $C_6H_4 \cdot OH \cdot COOH$. The calculated amount of salicylic acid in the official compound is 38·45 per cent.

The above method cannot be considered satisfactory, as it involves sources of error. The low percentage of bismuth found, when weighed as hydroxide, appears to be due to the formation of a little oxide, as shown in (*a*), and the high percentage of salicylic acid, as ascertained by a blank experiment, is at least partially due to the absorption of carbon dioxide by the alkali during the operation of heating.

(2) Messinger and Vortmann (*Ber. der deutsch. chem. Ges.*, 23, p. 2753) have proposed a method for determining salicylic acid which consists in precipitating it from its solution in an excess of alkali by decinormal iodine solution as diiodosalicylic iodide, and, after acidulating and filtering, titrating the excess of iodine in the filtrate with thiosulphate. The reaction takes place as follows:— $C_6H_4(OH) \cdot COONa + 3\,NaOH + 3\,I_2 = C_6H_2I_2(OI)COONa + 3\,NaI + 3\,H_2O$. Fresenius and Grünhut (*Zeits. anal. Chem.*, **38**, p. 292) have criticised the method, but Messinger has more recently shown that under proper conditions it gives accurate results (*Journ. prakt. Chemie*, **61**, p. 236, and *Chem. Centralb.*, Bd. i. 1900, p. 925). A trial of this method was conducted as

follows:—0·4782 gramme of bismuth salicylate was dissolved in dilute hydrochloric acid, the bismuth precipitated by sodium hydrate, filtered, and the filtrate and washings made up to 250 c.c. 50 c.c. of this alkaline solution were brought into a 100 c.c. stoppered bottle, neutralised with sulphuric acid, and then 0·5 c.c. of a 10 per cent. solution of sodium hydrate added. The bottle was then placed in a water-bath at 60° C., and when warm 31 c.c. of N/10 iodine solution was added, and the bottle kept warm and shaken occasionally for a few minutes. When cool, the contents were acidulated with sulphuric acid, filtered into a flask, and the precipitate washed with a little water. The filtrate required 15·1 c.c. of N/10 sodium thiosulphate, showing that 15·9 c.c. of N/10 iodine solution had been absorbed. As 1 c.c. of the latter corresponds to 0·0023 gramme of salicylic acid, this indicates 38·25 per cent. of salicylic acid in the salt. A second titration of 50 c.c. of the filtrate gave precisely the same result. This is in quite close agreement with the calculated percentage of salicylic acid in the salt, 38·45 per cent., and the method may be considered a fairly accurate one. It is important that there should not be too large an excess of alkali used.

Borax.

E. Merck (*Chemist and Druggist*, Aug., 1898, p. 348) has criticised the requirements of the quantitative test as being too stringent.

Caffeine.

According to some recently published notes on caffeine, a question appears to have been raised respecting the correctness of the Pharmacopœia statement that "at 100° C. the crystals lose 8·49 per cent. of their weight," which corresponds to one molecule of water. David Howard (*Chemist and Druggist*, April, 1898, p. 675) remarks that "he has never known it to lose the last trace of hydration at that temperature." Tasilly (*Brit. and Col. Druggist*, March, 1899, p. 249, from *Bull. Soc. Chim.*) states that "hydrated caffeine, $C_8 H_{10} N_4 O_2, H_2 O$, does not part with all its combined water, even when heated to 150° C., at which temperature caffeine begins to volatilise." The observation that caffeine loses its water of crystallisation at 100° C. is attributed to Strecker (Beilstein's *Handbuch der Org. Chemie*, Bd. iii. p. 957), and the writer believes it to be perfectly correct. The Pharmacopœia errs in its method of expression, as commercial caffeine probably never

contains 8·49 per cent. of water, owing to the facility with which the crystals effloresce. It would therefore be more correct to simply state that "at 100° C. the crystals lose their water of crystallisation."

A sample of caffeine, freshly crystallised from water, and dried on bibulous paper, was heated for two hours at 100° C., and on subsequently heating for another half hour the weight was found to remain quite constant, thus indicating that all the water had been expelled. The loss in weight was 7·13 per cent., which corresponds to that found by Allen—namely, 7·05 and 7·10 per cent. (see Allen's *Comm. Org. Analysis*, vol. iii., pt. ii. p. 475). Allen has thoroughly investigated this subject, and, as he remarks, it is probable that the deficiency is due to efflorescence, for the water of crystallisation is lost even by exposure over sulphuric acid at the ordinary temperature, so that it suffers no further loss of weight at 100° C. When heated to 120° C., it constantly loses weight, owing to slow volatilisation. It is obvious that with a freshly crystallised substance of this character it is impossible, when drying it in the air, to determine exactly when it has lost the last trace of adhering moisture, or, on the other hand, the point at which it begins to effloresce.

Caffeine Citrate.

The text of this article contains an error which also appears in the U.S. Pharmacopœia. This is that "with 3 parts of water it forms a clear, syrupy solution," whereas in reality it forms a stiff paste (see also *Proc. Amer. Pharm. Assoc.*, 1897, p. 714). If the mixture with three parts of water be gently warmed, it forms a clear solution, but, on cooling, it again forms an almost solid mass of acicular crystals of caffeine. The Swiss Pharmacopœia states that the compound is "readily soluble in four parts of hot water," which is quite correct.

The Pharmacopœia further states: "But more water (that is, more than three parts) dissociates the salt and affords a white precipitate of caffeine, which redissolves when *excess of water* is added." It would be somewhat strange if the compound should dissolve unchanged, as is implied, in exactly three parts of water, and that any further addition of water (how much "more water" is not stated) should dissociate it. It is quite well known, as the simplest experiment will prove, that the compound is dissociated as soon as it is brought in contact with water. If a little water be added to the warm solution, the caffeine separates out as a

mass of acicular crystals, and not in a form which might be understood as a "white precipitate." This is said to "redissolve when *excess of water* is added"—an expression which does not seem to be very well chosen, and which is certainly not very precise.

Calcium Hypophosphite.

In the text of this article it is stated: "*Heated to redness the crystals ignite*, evolving spontaneously inflammable hydrogen phosphide, etc.," and a similar statement occurs in the 1885 Pharmacopœia. This sentence seems to present some confusion of ideas, for it is not really the crystals which ignite, but the gases evolved by their decomposition. As the text reads, it would appear as if spontaneously inflammable gases were evolved when the crystals ignite, which, of course, is not possible. A more correct statement of the decomposition is given under sodium hypophosphite. There are several points in the text of the hypophosphites, both in the British and the U.S. Pharmacopœias, which are in need of revision, and which have been very thoroughly considered in a paper by Dr. H. A. D. Jowett, entitled: "The characters and methods of assay of the official hypophosphites" (*Pharm. Journ.*, Aug., 1898, p. 171).

Cerium Oxalate.

For an investigation of this salt, see a paper entitled: "The composition and determination of Cerium Oxalate," by F. B. Power and Frank Shedden (*Journ. Soc. Chem. Ind.*, 1900, pp. 636–642).

Chloral Hydrate.

E. Merck (*Chemist and Druggist*, August, 1898, p. 348) has noted that a solidifying point of fused chloral hydrate, such as that given by the Pharmacopœia, about 120° F. (48·9° C.) cannot be guaranteed, and that his own preparation solidifies at 44° C. The U.S. Pharmacopœia allows considerable latitude in giving the limits between 35° and 50° C.

Chloroform.

The Pharmacopœia states that "on allowing 20 c.c. to evaporate . . . no foreign odour is perceptible *at any stage of the evaporation*." The directions for conducting this test are probably not intended to be followed literally, as they would require an amount of chloroform to be inhaled which would be somewhat unpleasant in its effects. The test of the U.S. Pharmacopœia seems, in this respect, to be more practical, and also quite adequate—

namely, that when 20 c.c of chloroform are evaporated as directed, "no foreign odour should become perceptible *as the last portions disappear from the paper*, and the paper should be left nearly odourless when compared with a new, odourless filter."

Cocaine Hydrochloride.

There appears to be some doubt as to the correct melting point of this salt, but that given in the Pharmacopœia, 356° to 366·8° F. (180° to 186° C.), is evidently too low, and allows too much latitude. There is a superfluity of tests for identity. The important test with permanganate, as formulated by the Pharmacopœia, is quite useless and practically devoid of meaning. It states: "A solution containing not less than 1 per cent. gives *with excess of solution of potassium permanganate a copious red precipitate which does not change colour within an hour.*" This test, in order to be of any value, requires to be conducted under very definite conditions, and not by observing the colour of the precipitate, but the colour of the liquid. The expression "*excess* of solution of potassium permanganate," if used without restriction, would seem to permit the use of any indefinite amount of the latter solution. It is also not apparent how any change of colour in the red precipitate (if it undergoes any change) can be observed in a solution containing an excess of permanganate. It will be found of interest in this connection to compare the very precise, but necessary conditions for the proper application of this test, as given in the United States, German, and Swiss Pharmacopœias.

The melting point of *cocaine* is stated by David Howard to be 98° C., and not 96–98°, which would admit dangerous impurities (*Chemist and Druggist*, April, 1898, p. 675).

Codeine.

The following test of the Pharmacopœia for this alkaloid suggests some criticism. "*A saturated solution of codeine in water acidulated with hydrochloric acid* should give no blue colour, but only gradually a dull green, on the addition of test-solution of ferric chloride and a very dilute solution of potassium ferricyanide (absence of morphine *and other impurities*)." As the text reads, a *neutral* solution of codeine hydrochloride would be used in making this test, which would obviously be quite different in its character from the solution employed if a comma were placed after the word water, so as to read: "A saturated solution of codeine in water, acidulated with hydrochloric acid." Comparative experiments

will show that the test is best conducted in the latter form, that is, in slightly *acid* solution. The statement that this test shows the absence of morphine "and other impurities" is certainly much too broad and most incorrect, for it will by no means detect all other impurities, as might be inferred, nor even any considerable proportion of possible impurities. Compare, for example, Flückiger's *Reactions* (American edition, p. 76).

With respect to the solution of this alkaloid in sulphuric acid, reference may be made to the notes under the latter, and also to *Chemiker Zeitung* (*Repertorium*), 1897, pp. 80, 107.

Cotton.

Although cotton may not be considered a chemical preparation, the Pharmacopœia adopts a chemical test for its identity, which is of considerable interest if not of special pharmaceutical importance. This test is expressed as follows: "It dissolves in concentrated solution of copper ammonio-sulphate." The United States Pharmacopœia of 1890 makes a similar statement, namely, "insoluble in ordinary solvents, but soluble in copper ammonium sulphate solution," which likewise occurs in Maisch's *Organic Materia Medica*. This appeared to the writer to be incorrect, and a reference to numerous standard works, both chemical and botanical, as well as actual experiment, has served to confirm its inaccuracy. The well-known test for cellulose, commonly known as "Schweizer's Reagent," (not Schweitzer, as frequently mis-spelled), is an ammoniacal solution of cupric oxide, which has properties quite different from a solution of copper ammonio-sulphate. In Beilstein's *Handbuch der Org. Chemie*, 3rd ed. Bd. i. p. 1073, with reference to Schweizer, *Jahresbericht über die Fortschritte der Chemie*, 1857, p. 247, it is simply stated that "Cellulose dissolves in ammonio-cupric oxide (Kupferoxydammoniak)," and that it is precipitated from the solution by acids and *salts*. A similar statement is found in Tollen's *Handbuch der Kohlenhydrate*, Bd. i. p. 228, Allen's *Commercial Organic Analysis*, vol. i., p. 388, and in numerous other works. In Cross and Bevan's work on *Cellulose*, 1895, p. 13, they note that "Mercer has shown that the reaction of cuprammonium with cellulose is retarded by the presence of salts, and hence that the solutions obtained by decomposing the copper salts with excess of ammonia were much less active than equivalent solutions of the pure hydrate." In Erdmann's *Lehrbuch der Anorganischen Chemie*, p. 688, reference is made to a basic copper sulphate, obtained by precipitating a solution of the latter

salt with such an amount of potassium hydrate that the liquid does not become alkaline, which, when dissolved in ammonia, forms a liquid that is capable of dissolving cellulose. This solution would be quite different, however, from an ordinary solution of copper ammonio-sulphate.

As an experiment, a solution was prepared having twice the strength of the official solution of copper ammonio-sulphate, and pure white cotton was digested with this for a week. At the end of that time the cotton remained quite unchanged, and the liquid, when acidulated, also remained perfectly clear, thus indicating that no cellulose had been dissolved. On the other hand, a solution of ammonio-cupric oxide, prepared by precipitating cupric hydrate in the presence of a little ammonium chloride, and dissolving the well-washed precipitate in a 20 per cent. solution of ammonia, dissolved cotton abundantly and almost immediately. This solution, when acidulated, afforded the characteristic gelatinous precipitate of cellulose.

It appears that the ammoniacal solution of cupric oxide is occasionally confused with the solution of copper ammonio-sulphate, and this is probably the explanation of the error in the Pharmacopœia. This occurs, for example, in the *Pharm. Journ.*, September, 1899, p. 285, where, in an abstract, it is stated that "for the volumetric determination of alkaloids E. Falieres advocates the use of an *ammoniacal solution of cupric oxide*," and immediately following, that "the copper solution is prepared by dissolving cupric sulphate in water, adding ammonia, etc." The two solutions are, of course, not identical, either in their composition or properties.

Creosote.

This is such a complex substance, and also so variable in composition, that the determination of correct standards for its quality or purity is attended with considerable difficulty. There appears, however, to be one error, in the text of the Pharmacopœia, namely, the statement that "it rotates the plane of a ray of polarised light to the left." In the Pharmacopœia of 1885 it was stated to rotate polarised light to the right. J. C. Umney (*Pharm. Journ.*, January, 1900, p. 8), in commenting on this subject, remarks that "as a matter of fact practically all the beechwood creosote found in commerce is either slightly dextro-rotatory or devoid of optical rotation." Allen, *Commercial Organic Analysis*, vol. ii., part 2, p. 285, makes the following comment: "Creosote is commonly

stated to be optically active. The British Pharmacopœia of 1885 alleged that it was dextro-rotatory, while the edition of 1898 asserts that it is lævo-rotatory, both statements being misleading. As a rule, wood creosote exhibits no sensible optical activity." Five different specimens examined by the writer, and more fully described below, were found to be *perfectly inactive optically*. An error occurs in Allen's work, *loc. cit.*, p. 277, in the statement that "wood-creosote does not coagulate albumin."

It was thought of interest to ascertain the characters of some commercial creosotes, and the following specimens were therefore procured, and their physical constants determined. They were designated as follows:—

(1) Beechwood creosote, first quality.
(2) Beechwood creosote, second quality.
(3) Wood-tar creosote, first quality.
(4) Wood-tar creosote, second quality.

All of the above were obtained from an English manufacturer.

(5) Pure beechwood creosote.

The latter was an old specimen of French origin.

	(1)	(2)	(3)	(4)	(5)
Specific gravity at 15° C. .	1·089	1·089	1·079	1·058	1·085
Polarisation	All optically inactive.				
Diminution of volume when shaken with 5 volumes of 10 p.c. NH_3 . .	15 p.c.	13 p.c.	5 p.c.	2·5 p.c.	4 p.c.

On distilling 100 c.c. the following results were obtained, the mercury being entirely in the vapour of the liquid:—

(1)	190–200° C. (7 p.c.);	200–220° (84·4 p.c.);	220–240° (8 p.c.)
(2)	—	210–220° (27 p.c.);	220–240° (66 p.c.); 240–260° (5 p.c.)
(3)	—	210–220° (23 p.c.);	220–233° (75 p.c.)
(4)	—	—	230–240° (49 p.c.); 240–260° (50 p.c.)
(5)	190–200° (2 p.c.);	200–220° (86 p.c.);	220–233° (10 p.c.)

The specific gravity may apparently be safely required to be not below 1·080 at 15° C. The present United States, German, and Swiss Pharmacopœias state not below 1·070, and the French Codex 1·067. Other characters might be more correctly expressed if required to be *optically inactive, or nearly so*, and that it should distil, *for the most part*, between 200° and 220° C. The test with 10 per cent. ammonia does not appear to be of special value, inasmuch as the purest creosote shows the greatest diminution of volume.

The United States, German, and Swiss Pharmacopœias include a test for propyl-guaiacol (cœrulignol) and other objectionable impurities by shaking creosote with twice its volume of petroleum spirit and baryta water. This test is evidently of some importance. In the specimens examined (2) gave a blue colour in the petroleum spirit layer, and with (4) the aqueous layer was coloured a deep red; the other samples gave no very marked reaction.

Iron Arsenate.

This salt is, fortunately, recognised by but few modern pharmacopœias. Even those which have adopted it give different methods for its preparation, and, as found in commerce, it appears to be quite variable in composition. The official method of preparation and determination has already been criticised to some extent by Thos. S. Barrie (*Chemist and Druggist*, May, 1900, p. 884). With regard to the proportions given in the process for its preparation, Mr. Barrie notes that "the amount of sodium arsenate is excessive, and that 20½ ounces is sufficient for the complete precipitation of the iron." If one takes the pains to examine the subject a little more closely, it will indeed be found full of perplexity. The Pharmacopœia directs crystallised ferrous sulphate and anhydrous sodium arsenate to be used, and if we assume the reaction to take place according to the following essential factors of the equation, it may be represented as follows:—

$$\underset{834{\cdot}6}{3\,Fe\,S\,O_4{\cdot}7\,H_2\,O} + 2\,\underset{372{\cdot}22}{Na_2\,H\,As\,O_4} = Fe_3\,(As\,O_4)_2$$

Thus 415 grammes of ferrous sulphate would require, theoretically, 185 grammes of sodium arsenate, instead of 530 grammes, or 20¾ ozs. of ferrous sulphate would require 9¼ ozs. of sodium arsenate, instead of 26½ ozs., as prescribed. The 1885 Pharmacopœia directed for the same amount of ferrous sulphate 15¾ ozs. of anhydrous sodium arsenate, an amount still largely in excess. Even if the amount of sodium arsenate were calculated for the crystallised salt, it would still be considerably in excess, for the above amount of ferrous sulphate would then require 310·5 grammes and 15½ ozs. of sodium arsenate respectively.

The process given in the French Codex appears still more inconsistent, since the latter directs for 10 parts of ferrous sulphate 50 parts of crystallised sodium arsenate, corresponding to 29·8 parts of the anhydrous salt. This would be equivalent to 1236·7 grammes of anhydrous sodium arsenate for 415 grammes of crystal-

lised ferrous sulphate. The French Codex, however, assigns to the salt the composition $FeHAsO_4$, and therefore directs no sodium bicarbonate to be used in its preparation. It must thus be considered that the Codex assumes the reaction to take place as follows :—

$$\underset{278{\cdot}2}{FeSO_4{\cdot}7H_2O} + \underset{312{\cdot}25}{Na_2HAsO_4{\cdot}7H_2O} = FeHAsO_4 + Na_2SO_4 + 14H_2O.$$

These proportions would correspond theoretically to 11·22 parts of crystallised sodium arsenate for 10 parts of ferrous sulphate, and the proportion directed of the former therefore appears to be enormously in excess. It is, moreover, not at all probable that a salt of the composition indicated is formed by this reaction. (Compare also the criticisms by Hirsch, *Universal Pharmakopöe*, Bd. i. p. 672.)

Mr. Barrie (*loc. cit.*) has further criticised the Pharmacopœia requirement that only the ferrous iron in this salt shall be determined. With consideration of the potency of this preparation, together with the fact that only one qualitative test for purity is given—namely, that for *sulphates*, it also appears to the writer that the determination of the arsenic acid is of infinitely more importance.

Saccharated Iron Carbonate.

The definition of the chemical character of this preparation, as given by the Pharmacopœia, does not seem sufficiently precise to be of much utility, and might just as well be omitted. Thus, "x $FeCO_3$ and y $Fe(OH)_2$, more or less oxidised," would also imply z Fe_2O_3. It, moreover, does not seem quite correct or logical to speak of a "ferrous oxycarbonate, more or less oxidised," and it is also doubtful whether a mixture dried at 100° C. would contain any ferrous hydroxide $Fe(OH)_2$.

Iron and Quinine Citrate.

The estimation of the quinine in this salt is much more conveniently accomplished with the use of chloroform than of ether.

Exsiccated Ferrous Sulphate.

The text of this preparation would appear to admit of some improvement. Instead of directing that ferrous sulphate should be exposed to heat "until aqueous vapour ceases to be given off," and that "the residue should weigh *about* 60 per cent. of the original

salt," it would seem much more practical and convenient to prescribe a definite loss of weight, which in the United States, German, and Swiss Pharmacopœias is uniformly fixed at 35–36 per cent. The quantitative test also appears to be very awkwardly expressed, inasmuch as it requires the product to contain an amount of iron corresponding to at least $92\frac{1}{2}$ per cent. of $FeSO_4 \cdot H_2O$. As the product does not correspond exactly to a salt of the latter formula, there is no apparent advantage in basing the calculation upon it. If a quantitative test is considered necessary, it would be much more simply expressed by requiring a certain percentage of iron in the ferrous state.

Reduced Iron.

The official method for determining the amount of metallic iron in this preparation is not a satisfactory one, and the details are not quite correctly expressed. A more accurate method is that with the use of mercuric chloride and potassium iodide, as formulated either by the United States or German Pharmacopœias (compare E. Merck, *Chemist and Druggist*, August, 1898, p. 348, also E. S. Peck, *Pharm. Journ.*, August, 1898, p. 159, and July, 1899, p. 109). A test for *arsenic* would also be desirable.

Tartarated Iron.

The Pharmacopœia prescribes the following method for determining the iron in this salt: "By incinerating 10 grammes at a red heat, washing the residue with water, and again incinerating with free access of air, a residue of ferric oxide is obtained weighing not less than 3 grammes." Although this may seem a very simple operation, any one who has conducted it will appreciate the difficulty of washing out the potassium carbonate from the resulting light carbonaceous mass, or of completely burning away the carbon, and even with the greatest care in these manipulations it is almost impossible to avoid loss and obtain approximately accurate results. It is therefore quite inexplicable why this method should be adopted in preference to the iodometric one, which is so much more simple, expeditious, and accurate, and which, as formulated by the United States and German Pharmacopœias, is applicable for the determination of iron in all the so-called scale salts, as also in the official solutions of iron. It was thought of interest to determine the percentage of iron in tartarated iron, and also in the iron and ammonium citrate, by the iodometric method, and to

compare these results with the official requirements by the method of ignition. For this purpose a sample of each of these salts was obtained from three of the leading London manufacturers, which may be designated respectively as A, B, and C. The iodometric estimations were conducted as described in the United States Pharmacopœia. Two determinations were made of each salt, and the mean of the closely agreeing results taken.

Tartarated Iron.

(*a*) Contained 19·95 per cent. Fe=28·50 per cent. Fe_2O_3.
(*b*) „ 18·93 per cent. Fe=27·04 per cent. Fe_2O_3.
(*c*) „ 17·10 per cent. Fe=24·43 per cent. Fe_2O_3.

The Pharmacopœia requires the salt to yield, by the method of ignition, not less than 30 per cent. of ferric oxide.

Iron and Ammonium Citrate.

	By Iodometric Method.	By Ignition.
(*a*) Contained	20·76 p.c. Fe=29·66 p.c. Fe_2O_3	30·75 p.c. Fe_2O_3.
(*b*) „	20·42 p.c. Fe=29·17 p.c. Fe_2O_3	32·56 p.c. Fe_2O_3.
(*c*) „	20·80 p.c. Fe=29·70 p.c. Fe_2O_3	31·86 p.c. Fe_2O_3.

The Pharmacopœia requires this salt to yield, by the method of ignition, 31 or 32 per cent. of ferric oxide, and the three specimens may be considered to meet this requirement; but, at the same time, the iodometric method, which gives somewhat lower results, undoubtedly indicates more correctly the actual percentages of iron contained in the salts. The difference in the results may be partly attributed to the presence of alkali, for the residues of ferric oxide from all the samples of this salt were alkaline to litmus, and the salt (*b*), which afforded the highest percentage of ferric oxide, was also the most strongly alkaline.

Hyoscine Hydrobromide and Hyoscyamine Sulphate.

Compare notes under Atropine.

Lithium Carbonate.

Some notes of interest relating to the characters and examination of this salt are given by L. F. Kebler (*Amer. Journ. Pharm.*, 1898, p. 600, *Pharm. Journ.*, December, 1898, p. 689).

Lithium Citrate.

From the figures given in the text for this salt it is assumed that when dried at 100° C. it loses 3 molecules of water, and at 115·5° C. an additional molecule, the salt thus dried being then

required to yield on ignition a residue corresponding to 98·5 per cent. of the pure citrate. These requirements, although precisely stated, are not quite correct, and in practice cannot be met. In the first place, there is no indication of the length of time at which the salt should be dried at the specified temperature, and at 100° C. a constant weight cannot be obtained. In the second place, all the water is not expelled at 115·5° C. (a statement also occurring in the French Codex), and a temperature of about 140° C. seems to be necessary. A more satisfactory method of determining the percentage of pure lithium citrate in the salt is by its conversion into sulphate (compare L. F. Kebler, *Amer. Journ. Pharm.*, 1899, p. 137, also E. Merck, *Chemist and Druggist*, August, 1898, p. 348).

The French Codex contains some peculiar errors in the text for this salt, as, for example, the statement (originating with Dorvault) that it is soluble in 25 parts of water. It also states that 1 gramme of the salt, when calcined with an excess of sulphuric acid, leaves 0·225 gramme of lithium sulphate, whereas the calculated amount of the latter is 0·585 gramme.

Magnesium Carbonate.

The same criticism would apply to the formula for this salt as to those given for bismuth subcarbonate and bismuth subnitrate. It is well known that the salt is of somewhat variable composition, and therefore cannot be represented by a definite formula such as that assigned to it by the Pharmacopœia, which nearly corresponds with that of the French Codex.

Menthol.

Messrs. Schimmel & Co. (*Semi-Annual Report*, October, 1898, p. 63) have commented on the Pharmacopœia description of this substance as being "in crystals usually more or less moist from adhering oil," and have noted that recognition is thus given to an impure article.

The colour reaction stated to be obtained when menthol is "boiled with sulphuric acid diluted with half its volume of water" is of exceedingly doubtful value.

Morphine Hydrochloride.

This salt is described as forming "acicular prisms, or a white powder consisting of *minute cubical crystals*." A similar description is given in the United States and Swiss Pharmacopœias, but it appears very doubtful whether the white powder form of the salt

consists of minute *cubical* crystals. The German Pharmacopœia describes it as occurring in "white needle-shaped crystals, or white cubical pieces (Stücke) of a micro-crystalline character." Beilstein (*Handbuch*, Bd. iii. p. 898), referring to Hesse, states that by slow crystallisation from alcohol the *anhydrous* salt is obtained in the form of short, four-sided rhombic prisms, and Guareschi (*Die Alkaloide*, p. 371) gives a similar description, together with that of the German Pharmacopœia. The salt would evidently be more correctly described as "in acicular crystals, or a white micro-crystalline powder." It is possible that an explanation of the apparent error may be found in the fact that for some time past certain manufacturers have brought morphine salts into commerce in the form of small, artificially-formed cubes, but the crystals of which these are composed are not cubical. Compare also E. Merck (*Chemist and Druggist*, August, 1898, p. 348).

Expressed Oil of Almonds.

J. C. Umney (*Pharm. Journ.*, July, 1899, p. 106, and January, 1900, p. 8) considers the test with fuming nitric acid to be incapable of detecting the presence of peach kernel oil, but useful for detecting apricot kernel oil. The United States Pharmacopœia (1890) had adopted this test for the detection of peach kernel oil, and the Swiss Pharmacopœia gives it as a specific test for the latter (*Pfirsichkernöl*), as also for rape-seed oil (*Repsöl*). Mr. Umney's observations are of special interest, as the tests were made with pure oils of peach kernels and apricot kernels, obtained both by expression and by extraction with ether. There is, however, an explanation which may serve to clear up this apparent discrepancy. According to Hirsch (*Commentar zum Arzneibuch für das Deutsche Reich*, p. 483), under the name of "Pfirsichkernen" (the only English equivalent for which is peach kernels), which are used in making the so-called *oleum amygdalarum gallicum*, are not to be understood the kernels of the common peach (*Prunus Persica*, Jess, *Amygdalus Persica*, Linné, or *Persica vulgaris*, Mill), but a small sort of the bitter almond, a variety of *Amygdalus communis*, Linné). This oil undoubtedly affords the reaction described in the Pharmacopœias.

Oil of Cloves.

A useful criterion for the purity of this oil, which might be considered by the Pharmacopœia, is its property of forming a clear solution with twice its volume of 70 per cent. alcohol.

Oil of Cinnamon.

For determining the percentage of cinnamic aldehyde, or of non-aldehyde constituents, in this oil, the Pharmacopœia directs that "if 10 c.c. be *well shaken with* 50 *c.c. of a boiling* 30 *per cent. solution of sodium hydrogen sulphite*, an oily layer separates, which, when cooled to 60° F., should not measure more than 5 c.c." These directions are quite inadequate, and in many cases would lead to very incorrect results, if not to complete failure. In the first place, it would obviously be a very difficult matter to shake the oil with a *boiling* solution of sodium hydrogen sulphite, and it is furthermore not desirable to add the entire amount of the latter solution at once, but in small portions, the flask being heated on a water-bath after each successive addition of the solution until the solid bisulphite compound has become completely liquefied. A proper description of the method of conducting this determination is given by Gildemeister and Hoffman in *Die aetherischen Oele*, Berlin, 1899, p. 505. A test for the purity of this oil, which is also of some value, is its property of forming a clear solution with three times its volume of 70 per cent. alcohol.

Oil of Copaiba.

In the *Pharm. Journ.*, January, 1900, p. 54, F. W. Short criticises the statement of the Pharmacopœia that this oil "should rotate a ray of polarised light from 28° to 34° to the left." This statement occurs under Copaiba, but in the text of the oil the factors of rotation are not mentioned. As Mr. Short has pointed out, they are misleading, for the limits of rotation should be much broader. A specific test for *gurjun oil* might be adopted (see *Amer. Journ. Pharm.*, 1897, p. 579), although this would also be indicated by a higher specific gravity and a higher optical rotation.

Castor Oil.

The Pharmacopœia has adopted a test with sulphuric acid for the detection of foreign oils, which is essentially the same as that given in the United States and German Pharmacopœias, but by introducing the slight verbal change of requiring that "the mixture should not become *brown*, instead of *blackish-brown*, the character of the test has been rendered inaccurate. (See also *Pharmaceutical Journal*, January, 1900, p. 8.)

Some brief critical notes on several of the official oils have also

been communicated by E. Dowzard, to which reference may be made (*Chemist and Druggist*, May, 1899, p. 814).

Physostigmine Sulphate.

This salt might, with advantage, be replaced by the salicylate, which is much more stable, and therefore more largely used. The Pharmacopœia indicates the sulphate to contain an indefinite amount of water of crystallisation, expressed as "$x H_2O$," but it is probable that, like the salicylate, the salt is really anhydrous, and that any water it may contain is simply hygroscopic moisture, due to its deliquescent character. Guareschi (*Die Alkaloide*, p. 495) regards it as anhydrous.

Pilocarpine Nitrate.

The Pharmacopœia has wisely adopted this salt of pilocarpine in preference to the hydrochloride, which is somewhat deliquescent. The text, however, is very imperfect (compare papers on this subject by Dr. H. A. D. Jowett, *Pharm. Journ.*, July, 1899, p. 91, and *Journ. Chem. Soc.*, 1900, p. 473). Subsequent observations would suggest a slight modification of two of the factors given for this salt in the first-mentioned paper, in order that they may meet practical requirements. The melting-point should be not below 173° C., and the specific rotation not lower than + 80°. The formation of a crystalline picrate, which melts quite sharply at 147° C., is also a useful criterion for the purity of this salt.

Potassium Tartrate.

The formula given in the Pharmacopœia for this salt is incorrect. It should be $(K_2C_4H_4O_6)_2 \cdot H_2O$, and the official requirement of the volumetric test is based upon the latter formula. If the salt had the formula $K_2C_4H_4O_6 \cdot H_2O$, one gramme of it, after ignition, would require about 8·2 c.c. of normal sulphuric acid for neutralisation, instead of 8·4 c.c., or, more correctly, 8·5 c.c. The error has probably arisen through the attempt to express the composition of the salt by a constitutional formula (see also *Pharm. Journ.*, September, 1899, p. 284).

Acid Quinine Hydrochloride.

E. Merck (*Chemist and Druggist*, August, 1898, p. 349) has noted that it is practically impossible to titrate this salt with normal alkali, the results with litmus as an indicator being too

low, and with phenolphthalein, or methyl orange, excessively high.

Quinine Sulphate.

Some interesting observations and criticisms relating to the official test for this salt are noted by A. J. Cownley and by David Howard (*Pharm. Journ.*, vol. lx., 1898, pp. 442, 447, 472).

Sodium Arsenate.

Thos. S. Barrie (*Chemist and Druggist*, May, 1900, p. 884) has justly criticised the official method for the quantitative determination of the purity of this salt by means of lead acetate. It is quite certain that no careful analyst would think of employing this method, and a quantitative determination can hardly be considered of value unless it is reasonably accurate. Moreover, the figures given for the test appear to be wrong, for, as Mr. Barrie has noted, 1 gramme of the salt would require 3·05 grammes of lead acetate for precipitation, instead of 2·03 grammes, the Pharmacopœia having assumed that an acid, and not the neutral lead arsenate, is formed, or there is possibly a typographical error (see also *Pharm. Journ.*, September, 1899, pp. 324, 355).

Sodium Hypophosphite.

See note under Calcium Hypophosphite.

Solution of Lead Subacetate.

The writer has found that this solution (sp. gr. 1·277), when freshly prepared, requires for 1 gramme 19 c.c. of decinormal sulphuric acid for complete precipitation. The lower figure, 17 c.c., given by the Pharmacopœia, would allow for the change which this solution rapidly undergoes. In the determination of the lead it is an advantage to dilute the solution with water, and use methyl orange as an indicator.

Sulphur.

It is somewhat surprising that the Pharmacopœia should make the requirement that sublimed sulphur "should not have any action upon litmus," and that "solution of ammonia, agitated with it, and filtered, does not on evaporation leave any residue." It is quite well known, as has been noted by E. Merck (*Chemist and Druggist*, August, 1898, p. 340), that neither of these requirements can be met. For this reason most of the modern Pharmacopœias

have adopted as a special preparation for medicinal use a purified sulphur, *sulphur lotum*, United States and Swiss; *sulfur depuratum*, German; or *soufre sublimé lavé*, French Codex, from which the free acid and arsenious suphide, or arsenious acid, have been removed by digesting sublimed sulphur with dilute ammonia, and washing with water.

Terebene.

Besides the British, this preparation is only recognised by the United States and Russian Pharmacopœias. Although of complex composition, and therefore somewhat variable in character, it admits of somewhat more precise and accurate description than is given by the Pharmacopœia. A chemical study of its constituents was made a few years ago by Power and Kleber (*Pharm. Rundschau*, New York, 1894, pp. 16–19), and from the results of that investigation it was proposed that it should be defined as "consisting for the most part of the hydrocarbons dipentene and terpinene, with some cymol and camphene." The preparation employed in that research represented a product that had been carefully prepared on a large scale. It was optically inactive, had a specific gravity of 0·855 at 15° C., and distilled chiefly between 170° and 185° C.

Three specimens of terebene have recently been obtained from leading London manufacturers and examined, with the following result. The samples may be designated as A, B, and C: —

	A.	B.	C.
Specific gravity at 15° C. . . .	0·863	0·862	0·865
Optical rotation in 100 mm. tube	−0·15′	−0·30′	Inactive.
Fractional distillation of 100 c.c.	—	—	—
–165° C.	1·0 c.c.	— c.c.	1·5 c.c.
165–170° C.	4·0 „	1·6 „	15·5 „
170–175° C.	24·4 „	38·0 „	44·5 „
175–180° C.	38·0 „	33·2 „	24·0 „
180–190° C.	27·0 „	21·2 „	8·5 „
Residue.	5·6 „	6·0 „	6·0 „
	100·0	100·0	100·0

It will be observed that the specific gravities of all the samples are in close accordance with the official requirements. The lower specific gravity referred to (0·855), as observed by the writer, may be attributable to the use of a more freshly distilled oil of turpen-

tine, although the specific gravity of terebene itself will also become increased by age. The statements of the Pharmacopœia, that "it should distil between 156° and 180° C.," and that "not more than 15 per cent. should distil below 165° C.," obviously require modification. It could not distil at the lower temperature unless it contained unaltered pinene, which would not be the case in a carefully prepared article, and which would also be indicated by its optical activity. It might properly be required to distil chiefly between 170° and 185°, or possibly 190° C. To permit as much as 15 per cent. to distil below 165° C. would admit a very inferior preparation. It has been noted by several manufacturers (*Year-Book of Pharmacy*, 1899, p. 396, and *Pharm. Journ.*, July, 1899, p. 104, January, 1900, p. 8) that a terebene made from American oil of turpentine may be slightly lævorotatory, as is indeed the case in two of the specimens examined, or that when originally inactive it may acquire optical activity on keeping. In this connection the observation of Dr. J. H. Long (*Journ. Amer. Chem. Soc.*, 1894, p. 844) is of interest, that American oil of turpentine sometimes has a very low positive rotation, or may even be lævorotatory, when containing the product distilled from the so-called spruce trees. The very slight lævogyrate rotation occasionally observed in terebene may be due to this fact, or possibly to the presence of a little lævogyrate limonene.

Veratrine.

The retention by the Pharmacopœia of a detailed process for the preparation of this alkaloid or mixture of alkaloids, when processes for all the other organic principles of this class have been deleted, has attracted the attention of several commentators. It would be interesting to know why an official process has been considered necessary for this substance, which is apparently one of the last things that a pharmacist would undertake to manufacture.

Conclusion.

In the preceding observations the writer has not attempted to consider the text of all the chemicals of the Pharmacopœia, but has necessarily restricted his comments to such statements as have from time to time been more prominently brought to his notice by a perusal of the work. Such an inspection, however, appears to indicate that the errors are somewhat more numerous than one might reasonably expect in a work of a national and authoritative character, and it is evident that some of these errors might have

been avoided, either by reference to standard chemical works, to current chemical literature, or by simple experiments.

There are naturally also some features of every Pharmacopœia of a more general character, which, quite apart from any actual inaccuracies, may properly form the subject of individual comment, such as its scope, or limitations, the arrangement of the text, character of the tests, etc., and a brief reference may be made to some of these.

(1) In the first place, as the Pharmacopœia has wisely omitted details of processes for nearly all the chemicals, which are now made almost exclusively and much more economically on a large scale, it might with advantage have gone a step further, and, in conformity with most of the modern Pharmacopœias, have omitted such information as it gives with respect to the methods by which the official chemicals are obtained. It does not seem probable that from any point of view the very brief and often imperfect information given can serve any useful purpose, as it may be found either in text-books on chemistry or in greater detail in works on chemical technology, to which those who desire to make any practical use of such knowledge will naturally refer. If a few examples be taken at random from the long list, one may consider the official description of the methods for obtaining lead iodide, mercuric iodide, or sodium arsenate, which is totally inadequate for any practical purpose, for it is quite important in the preparation of these chemicals, as, indeed, in most others, that definite proportions of the combining substances be employed, independent of motives of economy. In the case of sodium sulphocarbolate it is stated that "it may be obtained *by dissolving phenol in excess of sulphuric acid*, and converting the phenol-sulphonic acid so obtained into a sodium salt." The required para phenolsulphonic acid may *not* be obtained by simply dissolving phenol in sulphuric acid, and, besides, what is to be understood by an *excess* of the latter, and how is it to be removed? The statement under the corresponding zinc salt is more nearly correct, as it is said "it may be obtained *by heating a mixture of phenol and sulphuric acid*," etc., the word "excess" being omitted, and *heating* being specified, but here also the temperature at which the mixture is heated is of some importance. The formula of the zinc salt is wrong, as it contains 8 molecules of water. The information given regarding the production of sulphur, sodium carbonate and bicarbonate, mercuric and mercurous chloride, potassium nitrate, and innumerable other salts can hardly be considered necessary for the pharmacist, or of

particular value to any of those who require to make use of the Pharmacopœia, who may be assumed to possess a knowledge of these elementary facts. From an explanation given in the Preface, however, it would appear that this feature of the work is obligatory, since it contains (p. xiii.) the following statement:—"The paragraphs in former editions which were more or less descriptive of the sources or modes of preparation of official chemical substances have been abbreviated *as far as the requirements of the Medical Act of* 1858 *will permit*."

(2) There does not seem to be perfect uniformity in expressing the formulas of the official chemicals, as may be observed, for example, in the formulas for tartarated antimony and sodium potassium tartrate or potassium acetate and lead acetate. Among the reagents, methyl orange and phenol-phthalein, which are only used as indicators, are given constitutional formulas, or, in the case of the last-named, a complete structural formula. In the Preface (p. xiv.) it is stated that "extended structural or graphic formulæ, which would often occupy the space of several lines of print, have, as a rule, been excluded," but it is not quite clear why it should have been considered necessary in this single instance. For all the purposes of a Pharmacopœia, the simplest empirical formulas would doubtless be quite sufficient, but in connection with these it would be useful to state the respective molecular weights.

(3) In the text of the various chemicals we meet with such statements as the following one under lithium citrate:—"It yields the reactions characteristic of lithium and of citrates," or under lead oxide:—"It gives the reactions of lead." Facts of this character would be so self-evident to any one that it hardly seems necessary to note them unless special tests for identity are given. Throughout the work the expression "characteristic reaction" occurs, as under lead oxide:—"It should yield no *characteristic* reaction with the tests for copper, iron, or carbonates." The word "characteristic" would appear to be superfluous, for it would certainly be understood that a reaction employed in testing for these substances would be one characteristic of them.

(4) The plan adopted for stating the tests for purity, or rather, the substances to be tested for, may appear to possess the merit of simplicity, but it is a question whether it will not fail in its purpose and tend rather to discourage the testing of chemicals by those who are not, through more or less constant practice, kept conversant with analytical methods. Some of the lists of tests would require the substance to be taken pretty well through

the ordinary analytical chart, involving the separation of several groups of elements and several hours' work, and even then it is likely that some impurity might be overlooked if no special instructions are given. A good example of this is afforded by the text for bismuth carbonate, where it is stated:—"These bismuth salts, *when suitably treated*, should yield no characteristic reaction with the tests for silver, lead, copper, arsenium, iron, zinc, calcium, magnesium, chlorides, or sulphates, nor with the tests for selenium and tellurium." It may be safely asserted that a tolerably good analyst would require to give considerable thought to such a problem before deciding upon tests which would positively confirm the absence of all the above-mentioned elements, without involving their actual separation from each other. The facility with which these tests may be conducted depends very largely in this case upon the simple, but somewhat ambiguous, phrase—"when suitably treated."

Another example is afforded by the text of cerium oxalate, where it is stated that it should yield no characteristic reaction for various substances, including *calcium*. On referring to the list of tests given in the Appendix, there will be found under calcium two positive tests—namely, that "solution of ammonium carbonate yields a white precipitate," etc., and that "solution of ammonium oxalate gives a white precipitate," etc.; also, as a negative test, that "solution of potassium chromate gives no precipitate"; but none of these tests are applicable for the direct detection of calcium in cerium oxalate.

An apparent justification of the plan adopted by the Pharmacopœia with respect to the omission of specific tests for the detection of impurities in chemicals is afforded by the following explanatory statement in the Preface (p. xiv.):—"Nor are manipulative details set forth at length, either as regards the preparation of a substance for testing, or as regards the solution or application of the tests, *the pharmacist being assumed to possess full knowledge of these and all similar points*." If it be assumed that the pharmacist possesses such full knowledge on these important points, it certainly does not seem quite consistent that it should be considered necessary to explain how all the chemical preparations of the Pharmacopœia are obtained.

(5) In some cases, however, specific tests are given in the Pharmacopœia, as, for example, the test for thiocyanates in potassium bromide. The necessity for such exceptions to the general rule is not obvious, for any one capable of conducting the tests for the

other substances mentioned—lead, copper, arsenium, iron, aluminium, zinc, calcium, magnesium, sodium, ammonium, bromates, iodates, cyanides, etc.—would, in all probability, also be familiar with the simple test for thiocyanates, or could at least refer to it in some chemical work.

Under potassium carbonate it is stated that, "it should yield *only the slightest reactions* with the tests for iron," and "*no strongly-marked reactions* with the tests for chlorides." It is difficult to surmise what difference in the intensity of the reactions is intended to be permitted in these two differently-worded tests. Neither form of expression is sufficiently precise, for no definite standard of purity can be maintained or required when it is left entirely to individual judgment to decide as to what may constitute a strongly-marked or a slight reaction. In some cases the Pharmacopœia appears to have gone to the opposite extreme in being unduly exacting in its requirements, as, for example, under sodium, where it is stated that "*each* gramme very cautiously added to water affords a solution which should require for neutralisation at least 42·6 c.c. of the volumetric solution of sulphuric acid." The purity of commercial metallic sodium is such that there would seem to be no practical necessity for a quantitative test of this character.

(6) The question may be suggested whether it would not be an advantage to those using the Pharmacopœia if the impurities to be tested for were rendered more prominent by placing them in italics, rather than the names of the reagents used for their detection, or as tests for identity.

(7) "*Articles Employed in Chemical Testing.*"—In this list a method is given for preparing barium hydroxide, which appears quite unnecessary, since it is as easily available an article of commerce as the barium chloride which precedes it. One reagent occurs twice in the list, as "*calcium oxide*—the lime of the British Pharmacopœia," and as "*lime*—the lime of the British Pharmacopœia." Considerable space might be saved by the omission of the frequently-repeated words, "of the British Pharmacopœia," and the desired purpose would be just as well accomplished if a simple statement were made at the head of the chapter that such articles as are employed in chemical testing, when represented in the Pharmacopœia, or unless otherwise indicated, should respond to its tests for purity. Even under water the specific requirement is made that it shall be "the distilled water of the British Pharmacopœia." The requirement that the test-solution of ferric

chloride should be made from anhydrous ferric chloride has been commented on under Acetanilide. *Nessler's reagent* has been brought as a synonym under the title solution of potassio-mercuric iodide, and is referred to under that title in the tests for distilled water. The latter designation, however, is commonly understood to apply to the so-called Mayer's reagent. The more correct title of the official solution would be alkaline solution of potassio-mercuric iodide.

Under the reagent *sodium thiosulphate* (p. 402) it is required that "2·4644 grammes should decolorise 100 *cubic centimetres* of the volumetric solution of iodine." The use of this amount of substance would involve a quite unnecessary waste of iodine solution, as equally accurate results may be obtained with one-fourth the quantities specified. It is in marked contrast to the requirement, for example, under sodium potassium tartrate, that "each gramme, heated, etc., should require for exact neutralisation at least 7 c.c. of the volumetric solution of sulphuric acid." In the Preface, however, there is also a paragraph (pp. xiv., xv.) which may be considered to explain, although not altogether satisfactorily, this apparent lack of consistency, since it states: "In quantitative testing the specified amounts of solid or liquid substances are intended only as proportions indicating official standards of purity." . . . "In short, the procedure in these and other chemical operations is now left to the skill and judgment of workers *who are assumed to be duly trained*." In this case it would be much simpler to indicate only the percentage of purity required, without any details whatever, but if quantities such as 2·4644 grammes and 100 c.c. are specified, there is no reason why they should not represent such as may be more conveniently and more judiciously employed.

In concluding these somewhat extended observations, the writer desires to express his thanks to Mr. Frank Shedden, B.Sc., A.I.C., of the laboratory staff, who has assisted him in some of the experimental work connected therewith, and at the same time to entertain the hope that some, at least, of the recorded notes and comments may prove useful to those upon whom the preparation of a subsequent edition of the British Pharmacopœia may devolve.

The PRESIDENT, in moving a vote of thanks to the writer of this paper, said it had been stated by Dr. Attfield that it would take twenty years at least to make a comparatively perfect Phar-

macopœia, and an immense number of workers, and the more workers they had in this branch of investigation the more likely they were to approach perfection. It was quite true that a great deal of work had been done in a fragmentary and disjointed manner, but they had not got what they ought to have. Dr. Power's paper was a type of a collective criticism of the Pharmacopœia. This might well be taken up at the Society's Evening Meetings and at the meetings of the N.B. Branch immediately after the Pharmacopœia came out, so that there might be an amount of useful criticism on it, which would show the medical profession that they took a hearty interest in the work.

Dr. ATTFIELD had rather hoped to be allowed to speak last, but he thought if he made the remarks that he had to make at that juncture it might have the effect of shortening the discussion. It would be quite impossible to discuss the paper in its entirety or its details within any reasonable limit of time, therefore he would content himself by referring to the general lines of criticism. The paper might be divided into two parts—Dr. Power's remarks and the remarks of other people. It did not seem to him to be of much interest for Dr. Power to include in his paper the work of others which had already been published. That Conference was promoted for the encouragement of research, and so far as Dr. Power's paper dealt with research he welcomed it most heartily, but the part of the paper which referred to the views and statements of other people he thought was out of place at that Conference, although such remarks would be fitting for a report on criticisms on the Pharmacopœia to be laid before the Medical Council. This had already been done by the speaker, and his report had been distributed ten or twelve days ago. At times during the past year and a half, in accordance with instructions from the Medical Council, he had thus filled up his odd time while endeavouring to produce an Indian and Colonial Addendum to the Pharmacopœia, and had done the work which Dr. Power had partially and unnecessarily done in his paper—that was to say, he had reported to the Council every single criticism that appeared in the first year of the life of the Pharmacopœia of 1898. This report was carefully examined by a Committee of the Medical Council, and a certain number of criticisms that were not considered to be of much use to the Council in introducing the next Pharmacopœia were struck out, but nineteen-twentieths were put into print, and the Council had presented gratuitously to some 200 or 300 workers in research throughout Great Britain a copy of that report. That

being so, he thought the fair inference was that the criticisms of the following year would be treated in the same way. If they were, he thought it would be seen that that was a proper way of dealing with published criticisms. In his judgment Dr. Power's opinions were not those of a man who was thoroughly conversant with the British Pharmacopœia. He did not mean to insinuate that Dr. Power had not been a sufficient time in this country to study the British Pharmacopœia, nor that while he was in America he had not got his eye on it. But with regard, for instance, to Dr. Power's allusion to the introductory paragraph of each of the monographs of the chemical substances in the Pharmacopœia, Dr. Power did not seem to know that these were not intended to be complete descriptions. The statements respecting the methods of preparing the various chemicals has been kept as short as possible within the four corners of the Acts that governed the construction of the Pharmacopœia. Dr. Dobbin, who had criticised the Pharmacopœia, had given two or three illustrations where the descriptions were too short, and in that he agreed with Dr. Dobbin, and had said so as Reporter to the Medical Council. Dr. Power alluded to the paragraphs of the monographs relating to the number of substances which must not be present in the chemical substance that was being alluded to. No doubt if all the substances there mentioned were present in one specimen they would have to go through a very elaborate chart indeed, before separating them and proving that they were there or were not there, as the case might be. All practical men would know that the point was that neither one of those must be present, and anyone who was acquainted with either manufacturing chemistry or the chemistry which nowaday pharmacists were expected to possess would know pretty well what to look for, or would very soon find out what to look for, and would make their examination in a very rapid manner. Dr. Power's idea seemed to be that there should be a greater amount of elaboration in the chemical tests, but in that he did not agree with him. If the process of pharmaceutical education which had been going on for so many years meant anything, it meant that the pharmacists of this country had been increasing in their power of dealing with the chemical substances of the Pharmacopœia and ascertaining their purity. The speaker's view was that in future there should not be greater elaboration in these directions, but less. The allusions in the Preface to the efforts made for the education of pharmacists were intended to indicate that medical men recognised those efforts. With regard to the admirable

experiments Dr. Power had himself made, he felt sure when he saw the title of the paper that it would contain some valuable criticisms, and, so far as the work recorded was concerned, it was very valuable, and he should take care to bring it before the Medical Council. It was a series of checks on the work of previous workers that had been adopted from time to time in the Pharmacopœia. He would add one word on the general principle of adopting the results of workers without checking those results. There was no organisation in connection with the production of the Pharmacopœia by which the statements therein accumulated could be checked. When the first British Pharmacopœia was published the work of pharmacists was not recognised, and he was one of its strongest critics,—the result was that in three years the work was withdrawn and another was produced in which most of the researches of pharmacists which he had unearthed were included, and that Pharmacopœia lasted a good many years. In 1885 he had his way in this matter, and every one of the researches which had been made by pharmacists was included. Since 1885 he had issued nine annual reports, bringing before the Medical Council the researches of pharmacists, and it followed that the present Pharmacopœia must be better than any of its predecessors, because it included all those researches. What was now wanted was a large body of research workers, who would check the characters, remarks, properties, tests, etc., that had been published, and inserted in the official pages, from time to time, and who would examine and adapt all statements before they were introduced. Even atomic weights that had been determined by the best men had to be revised. Revision of old work was as necessary as research in new directions if a Pharmacopœia was to maintain its position as a work of authority. This could not be done at present, and he recently had a note from Dr. Jowett in which he recognised that, stating that he was under the impression that the physical constants of the Pharmacopœia had been checked, but, as had been stated by the President, there had never been enough workers or enough funds. It ought to be done, but at present he could not see how it could be done. Last year he suggested that such work would take a great number of men twenty years, and cost £20,000, but he now thought the figures ought to be doubled. His own opinion was that this work should be done by the help of the State, and that it should be done thoroughly, no matter at what cost. Some of the checking work of this kind could be done by men not far removed from the position of students under due

direction, another part by older men, the higher research work being done by men who had had longer experience. Some of the best work might not need any checking. However, good official checking work had been begun, and there was room for any amount of revision and research by volunteers, as he had pointed out in his recent Report.

After an adjournment for luncheon, Mr. C. T. TYRER said the limits of impurity must be such as could be attained in actual practice; they must all recognise the difference between a tub and a test tube, and due regard must be had to the exigencies of the manufacture. In some of these respects the B.P. was capable of improvement, and it was very proper that any deficiencies should be brought before the Conference. A good deal was said about official research, but most manufacturers had a staff for technical research in their laboratories, and their note-books contained a good deal of valuable information which in most cases would be at the disposal of the authorities. It was not so much research as arrangement and confirmation which was now required.

Mr. ALCOCK said the writer of the paper seemed to approve of the determination of preparations of bismuth by the incineration process, but he could not agree with him, because at the temperature at which an ordinary person would ignite the preparation, the bismuth was volatile, according to his experience. The large quantities of material prescribed in some cases in the B.P. was a great difficulty in the way of both teachers and pupils. There were other directions as to "excess," a "drop," and the like, which might be made clearer with advantage.

Mr. SAGE said this paper was worthy of attention, especially considering the author's connection with the U.S.P., which, though not perfect, was in many respects superior to the B.P. The tests given were more concise and more useful to the student and man of business than those of the B.P. You had only to look at the U.S.P. to find how to test any particular substance for any probable impurity. Why they should be invited to test a bismuth preparation for iron, tin, silver, copper, mercury, and other metals was hard to understand. They had to rely on the manufacturer for a great many things, and in these things they could generally be trusted. He hoped the section on the tests of the B.P would be carefully studied.

Mr. UPSHER SMITH said it was stated in the *Journal of the Chemical Society* that bismuth was not volatile even at the temperature of melting platinum. It seemed to him from the ex-

periments he had made that the incineration method was very satisfactory in determining the strength of any bismuth compound. He hoped in a few weeks to publish a small research on bismuth, in which he would give the figures he had obtained.

Mr. Watson Will said the bismuth problem was apparently rather troublesome, and certainly the B.P. method was decidedly bad. For some years he had used the method of precipitation as normal phosphate. If you took a bismuth salt, dissolved it in strong nitric acid, added strong sodium acetate, warmed it again and added a hot solution of sodium phosphate, it precipitated the bismuth as a normal phosphate—not a basic salt at all. He found the results produced by this method were very concordant, and it was worth trying, especially remembering what was said about the tendency of bismuth salts to become basic. He was not altogether at one with Dr. Attfield as to the tests for various substances, and undoubtedly the U.S.P. in this respect was superior. The old-fashioned method of estimating ferric salts as oxides was very cumbrous and unsatisfactory. Another point was the absurdly large quantity directed to be employed in some cases. In testing for antimony, using 3 grms. of sulphuretted antimony and igniting with nitric acid, you required an evaporating dish the size of a wash-hand basin in order to prevent loss by spurting; the whole method was absurd. Dr. Attfield said quite truly that they wanted some other method of estimating hydrogen peroxide, the gasometric method being very uncertain. There were three volumetric methods which gave fairly concordant results. He thought Dr. Power had a thorough knowledge of the B.P., and being an assistant compiler of the U.S.P., his views were especially worthy of attention. Why should the temperatures in the B.P. be in the Fahrenheit scale, with the Centigrade in brackets, the latter being always used now in text-books? In the melting point of carbolic acid a variation of 3° was given, which seemed very large, because the physical constants of a body were as good indicators of purity as any test which could be applied. The ascertainment of melting and boiling points required a great deal of care, but when the work had been properly done in a research laboratory there was no necessity to carry out a huge amount of corroborative work, as Dr. Attfield indicated, or you would never get to the end of it.

Mr. Martindale said he quite agreed that a great deal more investigation was required in order to perfect the B.P. and he understood that the Medical Council quite recognized that fact, and were endeavouring to deal with it. With reference to the chemistry of

the B.P., there was no doubt it required to be more definite. As to limits of purity, it should be acknowledged that absolute purity was almost impossible of attainment in many chemicals, and the limit should be one which could be reasonably expected of a manufacturer. Altogether the Pharmacopœia should be made more symmetrical. The U.S.P. was exceedingly well done in this respect; the standard was not put too high, and if it were found too low it was raised in the next edition. He did not agree in the view that research work should be done by the State; it was done much better by practical pharmacists and medical men. The German Pharmacopœia was the production of a Government bureau, and it was not anything like so useful and definite a work as the U.S.P., in which all probable impurities were referred to and defined. What was required was that the work should be carried on continuously between the publication of one Pharmacopœia and the next, and that it should be conducted on uniform lines though done by individual workers and firms.

Dr. COULL said the paper contained much food for thought. With regard to caffeine, Dr. Power suggested leaving out the percentage of water mentioned in the B.P. monograph; but a better plan would be to say that the loss should not be more than the amount equal to one molecule of water, it might be less. In determining bismuth he had no fault to find with the sulphide method, whereas by the ignition method one had to be sure the residue did not contain anything but bismuth. Regarding the tests for impurities in the monographs, he agreed with what had been said, that they ought to take a leaf out of the U.S.P. The B.P. should state the articles they were supposed to test for, and not give three or four lines of impurities which were not likely to be present.

Mr. LESCHER said when in their business they had any doubt about a thing, or wanted to examine it, they went to the British Pharmacopœia first, and took the American Pharmacopœia with it.

Mr. CUNNINGHAM said the paper was a very valuable one. He thought the author had shown that he knew a great deal about the British Pharmacopœia, and had clearly pointed out that it was not perfect, and he thought they should receive any criticism upon it with open arms. There had been a great many prosecutions under the Act, and the British Pharmacopœia, which had been shown to be imperfect, had been held up as the standard. He thought the imperfections of the Pharmacopœia ought to be

pointed out, and the man who undertook this task ought to be paid for it.

Mr. Rutherford Hill gathered that the author of the paper regarded the U.S. Pharmacopœia as a better pharmacopœia than the British, and, secondly, that he attributed this to a superior system for producing a national pharmacopœia. He agreed with the criticism that the author in his paper has introduced a quantity of material that was not original: with regard to gallic acid, for instance, this error had been drawn attention to by Mr. Dott at a meeting of the Society in Edinburgh. As to the language used with reference to citrate of caffeine, which was described as being more correctly citrated caffeine, and a little later on that the alkaloidal salt was dissociated in the presence of water, there seemed to be some confusion of language which required explanation. With regard to the morphine hydrochloride crystals, the small crystals were produced by a special system of crystallisation, and were not large crystals reduced to powder. The alkaloidal solution was evaporated till a crystalline magma was formed. This was dried and cut into cubes about one inch square, and the morphine hydrochloride was largely sent into the market in this form.

Mr. Cripps said there was an impression that the Pharmacopœia should give more specific limits for the amount of impurity in chemicals. Dealing with chemicals was different from dealing with drugs where there was a great amount of variation in ash and such constituents. He did not think the Pharmacopœia was ever intended to be a book to enable schoolboys to test chemicals; it was intended for men of sound judgment who had had a good training.

Mr. MacEwan said this was a topic on which there was a difference of opinion in regard to principle; he referred to the limitation of impurity. Dr. Power mentioned the matter in his paper, and Dr. Attfield specifically replied to it on the other side, and stated very fairly that there was a great deal behind the fixing of limits for impurities in the Pharmacopœia; referring to the incidence of the Sale of Food and Drugs Act upon the retailing of such articles. As he understood it from Dr. Power—with whom he had had very many conversations with regard to the revision of the U.S. Pharmacopœia, he having been responsible for the chemistry of that work—the way in which the U.S. Pharmacopœia authorities fixed the limits was this: they obtained from all known manufacturers specimens of their products; they obtained in the open market specimens of the articles which were

being commonly retailed and used, and they determined from those specimens what were the limits of purity and impurity that were obtainable in the open market. They also took the advice of the manufacturers and the various experts with regard to those limitations, whether they could be increased or diminished, and as the result the limits fixed by the U.S. Pharmacopœia for impurities were actualities. Obviously this applied to competitive commercial conditions; therefore, it ought always to be possible to get the products of that degree of purity; and there should be no difficulty whatever to the retailers so far as the Sale of Food and Drugs Act was concerned. He thought that the conditions which he had described should be seriously considered in regard to settling the difference of principle which existed.

Dr. JOWETT, replying on behalf of Dr. Power, said most of the criticisms on the paper had been answered during the discussion. Of course the opinions expressed in the paper were the opinions of Dr. Power and not his own, therefore he could not reply to the criticisms which had been made upon them. Dr. Attfield in his remarks had dealt chiefly with the opinions of the author, and had not devoted much time to a consideration of the experimental details. He agreed with what had been already said that day—namely, that outsiders sometimes saw the best of the game, and it seemed to him that Dr. Power was in the peculiarly happy position of being an outsider, and of being able to pass an impartial criticism on the Pharmacopœia. He thought his suggestions should receive the most careful consideration, particularly as—as was apparent from the discussion which had just taken place—the majority of the pharmacists who were present seemed to think the U.S.P. method of putting the tests was preferable to that of the B.P. With regard to the inclusion of references in Dr. Power's paper, they were not very numerous, and if they were deleted it would not make much difference in the bulk of the paper. Many of them were necessary on account of what followed, but even when they were simply references, many of them were written before Dr. Attfield's criticisms appeared, and Dr. Power was not aware that such a work was in progress. With regard to checking results, when a work involving the labour of many years was communicated, if the *bona fides* of the worker were accepted, it was not usual to have it checked, and it would certainly seem a waste of time for work which had occupied many years to be checked when that worker could be doing some new work that was wanted. When all the work that was re-

quired for the Pharmacopœia had been done, then perhaps they could spend their time in checking results, but certainly some of the work which had been done could not be checked, except by a worker of equal standing with the original investigator. With regard to the statement that a large sum of money and an immense number of chemists working on certain points would be required to make a complete Pharmacopœia, he could not help thinking that many of the practical mistakes in the present Pharmacopœia could have been obviated if the monographs had, before being printed, been submitted to those who had some practical knowledge on the subject. With regard to what Dr. Power said with reference to the difference between the way in which the tests were put in the B.P. and the fuller detail in the U.S.P., he thought that gentleman was referring more especially to the inconsistency of the B.P. In the B.P. would be found a list of tests in which the details were left to the chemist; but when you came to sodium you were told that so much sodium when dissolved in water would require a certain amount of acid to neutralise it. Sodium was one of the last things that would be tested in that way, but surely that was a detail that could be left to the chemist. With regard to Mr. Tyrer's remarks, no doubt manufacturers had a store of information in their laboratory note-books which, if available to the Pharmacopœia, could help the authors of that work to a very great extent. With regard to bismuth, he did not know what evidence Mr. Alcock had that oxide of bismuth was volatile.

Mr. ALCOCK said he was speaking of the evaporation of the ammonio-citrate of bismuth and subsequent ignition; that would give carbon, it would give you the metal, and the metal would be volatilised to some extent.

Dr. JOWETT, continuing, said the morphine hydrochloride was chiefly in fine crystals or in a powder.

A hearty vote of thanks was accorded to Dr. Power for his most useful communication.

The next paper was read by Mr. W. C. ALLEN, and was on: —

ALMOND OIL AND ITS SUBSTITUTES.

By W. C. Allen and E. T. Brewis, F.I.C.

In speaking of almond oil, we have to remember at the outset that almonds are produced in many countries, and although most of those that reach our market are shipped from a zone falling between the 30th and 45th parallels of N. latitude, that might be broadly described as "Southern Europe and countries adjacent," we have within that limit to deal with fruit produced under varying conditions both of climate and soil. This is evident when we glance at the different countries from which we get our principal supplies, viz.:—Morocco, Canary Islands, Portugal, Spain, France, Italy, Sicily, Syria and Persia.

Möller, in his *Lehrbuch der Pharmacognosie*, states that approximately, "Almonds contain 50 per cent. of fatty oil, 23 per cent. albuminous bodies, 6 per cent. sugar, and 3 per cent. gum. Starch is absent. Bitter almonds contain in addition, 3 per cent. of a crystallisable glucoside *amygdalin*, which in the presence of water, is acted upon by the emulsion, and decomposed into hydrocyanic acid, sugar and volatile oil of bitter almonds."

The above percentage of fatty oil appears to be considerably exaggerated—the estimate of Schaedler (45 per cent. from sweet and 38 per cent. from bitter) being much more in accordance with practical experience.

In a company of pharmacists it is hardly necessary to recall the fact that the "almond oil" of commerce is almost entirely obtained by the expression of *bitter* almonds. The expressed oils from "sweets" and "bitters" do not differ from each other in any material degree (compare Valencia sweets and Sicily bitters), whilst the additional product, "essential oil of almonds," obtained by distillation of the "press cake" from the latter, enables the manufacturer to supply almond oil at a price that would not be possible were really sweet almonds alone used. We say advisedly "really" sweet almonds, because at the present time, many so-called sweet almonds are being used by manufacturers, which would prove very disappointing to any one seeking a few minutes' pleasant and contemplative recreation by masticating them.

Morocco, or as they are more commonly known, "Barbary" bitters, at any rate those from the port of Mogador, are always more or less mixed with sweets, and whether they are termed "sweet" or "bitter," appears to be largely a question of the paint brush, which can readily produce an "S" or a "B," according as

the state of the market demands a supply of one or the other. The exports from the more northerly ports, viz :—Saffi, Mazagan, and occasionally Rabat, appear less open to this objection, though a slight admixture is usually met with. The supplies from Sicily are not only of larger growth, but are prepared for the market in a superior manner, being cleaner and more thoroughly sorted into their respective classes, "sweet" and "bitter." Thus here again we must note a difference even in bitter almonds, and whilst our suggested masticator would find even the ordinary Mogador "sweet" almonds, bitter, if on the other hand he had got hold of true Sicilian bitters, his language might not bear "qualitative analysis." The important production of the Canary Islands holds a somewhat intermediate place between that of Morocco and Sicily, whilst French, Syrian and Persian may be said practically to resemble the Sicilian almonds as regards the quality of the oil they produce. In view, therefore, of these differing sources of supply, we cannot expect absolute uniformity in results upon the examination of the various oils, more especially by colour reactions. Fortunately, these differences are but slight, and in no case do they reach a limit that would cause difficulty in distinguishing a genuine almond oil from one containing any of the ordinary adulterants.

The differences in the requirements of the British Pharmacopœia and those of the United States and Germany are not great. The American suggestion of a possibly "colourless" oil, appears to foreshadow a state of perfection hardly to be anticipated here below, if we are speaking of the commercial product. The colour is readily affected by prolonged exposure to light, and the oil can of course be bleached by artificial means, but concurrently with these conditions it suffers greatly in flavour.

The B.P., 1898, states that almond oil does not congeal until nearly −20° C. The German merely says that "it remains clear at −10° C.," whilst the U.S.P., with its usual thoroughness, combines the two statements. The lower limit appears to be reasonable, and conforms to our experience. All three authorities unite in giving the nitric acid test, while the German and the United States stipulate, in addition, a test dependent upon the melting point and solubility of the free fatty acids.

This nitric acid test has replaced that given by Bieber (*Analyst*, 1884, p. 83), who was the first, we believe, to draw attention to the means of discriminating between almond and the so-called "peach kernel oil." We owe much to his investigations, which

brought to the knowledge of the trade how extensively the cheaper oil was being sold as "almond oil," or used to make the true "oleum amygdalæ dulc.," become like the product of "the widow's cruse." Although his reagent is now apt to be considered obsolete, in favour of the nitric acid test, and rightly so, we think, it is interesting to note that when comparative tests are made by the two methods, on a series of oils, *some* of the differing characteristics of individual samples are brought out more clearly by the Bieber; and this is more especially noticeable after the lapse of some hours. We may, however, add that we find that the proportions 1 to 4 rather than 1 to 5 present advantages in actual working.

Maben's results (*P.J.*, 1885 [3], 16, 797), using nitric acid, sp. gr. 1·42, differ from those of other observers, and have repeatedly been quoted by authors who seem to have overlooked his explanation in a later number of the Journal (*P.J.*, 1886 [3], 16, 976), that the oils upon which he experimented were not those usually met with in English commerce.

Later, Micko (*Analyst*, 1893, p. 149), pointed out that the peach blossom colour ascribed by Bieber to peach kernel oil was really due to the oil from apricot kernels.

No reference to the chemical reactions of almond and kernel oils would be complete without mention of the helpful researches of Mr. J. C. Umney, who has done so much in aid of scientific production in British manufacturing pharmacy.

Since light has been thrown upon this question, we believe that adulteration of almond oil is comparatively rare. It is *substitution* rather than *adulteration* that is the practical question of the day. At the present time this question has become acute, the damage done to growing crops of almonds by the unseasonable frosts in the spring of last year and this, has brought about a phenomenal advance in the cost of the fruit, which has in turn affected the price of the oil. The temptation to substitution is therefore considerable.

Of such substitutes, peach or apricot kernel oils, above alluded to, stand foremost. They are, indeed, the only ones that need serious discussion, and we may here state that though it is interesting from a scientific point of view to trace the difference between oil from peach kernels and that from the kernels of apricots, for practical purposes, we may take the two as interchangeable. Shipments, although now consisting chiefly of apricot kernels containing occasional packages of peach, in the past have been known to

the trade as "peach kernels," and it was this that originally guided us to use, what then appeared to be the correct title for the product, "oleum amygdalæ persicæ," from *Amygdalus persica*, the peach, and not, as some of our friends have freely translated it, "Persian almond oil." This oil, now so largely produced at home under its distinctive name, yet constantly described from abroad as "almond oil," has a good deal of resemblance to its illustrious namesake. It is slightly more limpid and possesses a more nutty flavour than the true almond oil, the rich, bland, soft taste of which can be recognized by an expert.

These kernel oils have not the same keeping quality as the oil for which they are substituted, and this, together with their greater limpidity, has been the cause of various troubles, where they had been unwittingly used in place of almond oil. The red colour reaction of apricot as compared with the yellowish-white of almond is characteristic and sharply marks a distinction between the two.

But here we have to notice another branch of our subject. Now that oil of kernels has become extensively known, it has in turn attracted the unhallowed attention of those who have a partiality for representing things that "are not" as though they "were."

In recent years we have met with many cases of undoubted adulteration, and within the last twelve months have noticed this to a very marked extent. Out of at least seven representative samples of foreign oils obtained from different parts of the country, one only could be recognised as an unsophisticated kernel oil. The principal adulterants to be looked for are oils of rape, cotton-seed, sesamé, poppy, olive, and arachis. But this is a branch of the subject with which we have no practical experience, and we have found some difficulty in obtaining reliable information. We have, however, seen certain specimens which had nothing in common with "almond oil," whose name they bore, *or* of the kernel oil so often used as a substitute.

In conclusion, whilst we believe that almond oil will always be *facile princeps* amongst fixed oils, we see no reason why the true peach or apricot kernel oils should not continue to find a useful place where they are suited to any particular manufacture, but we should certainly protest against any substitution of the one for the other without the knowledge of the purchaser.

The table accompanying this paper shows results obtained from various samples of oil that have passed through our hands recently.

No.	Name.	Sp. G. at 15° C.	Saponif. Value.	Hübl Iodine Value.	Hehner Bromine Thermal Test° C.	Nitric Acid Test.		Bieber's Test.
						At First.	Afterwards.	
1	Mazagan Bitters . . .	0·9188	191·5	101·26	21°	White, greenish yellow >2*	White solid in yellow oil—colourless liquid.	Yellowish white >2*
2	Barbary „ . . .	0·9178	192·4	98·22	21°	„ „ „ <1		„ „ <1
3	„ „ . . .	—	—	99·14	22°			
4	Canary „ . . .	0·9188	—	98·33	21°·2	„ „ „ =2		White=5 and 6
5	Sicily „ . . .	0·9188	—	95·94	20°·6	„ „ „ =2		„ =4 and 6
6	Blanch. Valencia Sweets	0·9184	—	95·8	20°·8	White		„ =4 and 5
7	Persian Bitters. . . .	0·9177	190·8	98·86	21°	White, greenish yellow =2		Buff white=10
8	„ „ . . .	—	—	96·8	21°	„ „ „ =2		
9	French Pressed . . .	0·9186	—	97·5	22°	White		White=4, 5, 6
10	Peach Kernel . . .	0·9185	191·2	95·15	21°·6	Pale pink quickly changing	Deep orange coloured oil—colourless liquid.	Buff white=7
11	Apricot „ (Syrian) .	0·9182	192·3	100·7	22°	Salmon red		Deep salmon red
12	French Pressed. . . .	0·9218	—	118·3	24°·8	„ „		Salmon red
13	Foreign „ . . .	0·9180	191·2	101·39	21°	„ „		
14	„ „ . . .	0·9222	194·1	122·33	25°	Brownish red		
15	„ „ . . .	0·9221	190·7	120·72	25°·2	„ „		
16	„ „ . . .	0·9231	192·4	125·82	26°	„ „	Various brown shades.	
17	„ „ . . .	0·9233	192·2	127·1	26°·4	„ „		
18	„ „ . . .	0·9228	—	122·6	24°·8	„ „		
19	„ „ . . .	—	193·2	114·33	25°·8	„ „		
20	Apricot Krnl. (Californ.)	—	—	108·2	23°·4	„ „		
21	Cherry „	0·9303	—	124·9	25°·3	Yellow	Blackish brown.	

* = Shades about equal; > darker than; < lighter than.

The PRESIDENT said they were not all in a position to judge of the quality of almond oil by the taste or the smell. In these days of cheap articles, stores, and keen competition, there is always a tendency to lower the quality, and no doubt a great deal of the oil that came from France was adulterated. One cause of the impurity of the French almond oil was that the steamers that plied between Syria and Marseilles collected kernels at different ports on their route. Samples which he had seen that had come in this way from Marseilles were more or less of a mixed character. He thought there was room for histological investigation of the kernels which came into commerce, so that a means might be found of ascertaining whether they were mixed or not.

Mr. PRIEST had listened with great interest to the paper, and felt that it had added considerably to their knowledge of the chemical constants of these oils. The figures in the table which had been placed before them gave no idea of the amount of work that their compilation involved. Analysts had to obtain their samples through two or three hands, and thus did not always get at the true source of the drugs on which they worked, and as Messrs. Allen and Brewis had pressed out most of these samples, the figures were the more valuable. It was very difficult to criticise figures which had only been before them for half an hour or so, but two or three things came to his mind about which he should like to put some questions. On looking at the table the Mazagan oil seemed to stand out by itself, the figures seemed to be higher than that of any other almond oil. Speaking of the Barbary oil, which formed a large proportion of the oil on the market, he should like to ask Mr. Brewis how much, in his opinion, of the other oils, the Syrian, for instance, might be added without giving the difference in the nitric acid test, as it seemed from the iodine absorption, specific gravity and bromination figures, that a very large percentage of this Syrian kernel oil might be added to the Barbary oil without bringing these figures above those of the Mazagan variety. If the nitric acid test failed to show the presence of the kernel oil, he did not see how such an adulteration was to be detected.

Dr. ATTFIELD wished to ask whether, in Mr. Brewis's opinion, the nitric acid test was sufficient, as it seemed to him that it was not.

Mr. CRIPPS had had experience in testing almond oil, and in his opinion, for the detection of anything like a quantity the

nitric acid test was very reliable. In his opinion, it would be easy to detect ten per cent. of apricot oil in almond oil. Judging from the table before them, the danger of adulteration was not from apricot or peach oil, but from either cotton-seed or some similar oil.

Dr. McWALTER asked whether the authors of the paper had tested the almond oils which answered the (B.P.) test only after six to eight hours.

Mr. BREWIS in reply to Mr. Priest, said that with Syrian apricot kernel oil (No. 11) the nitric acid test gave a red colour, and if the Bieber test were employed, the coloration was much darker; that in itself would detect the admixture. Although he was not in a position to give definite figures, he believed that ten to fifteen per cent. could easily be detected.

With reference to Dr Attfield's enquiry as to whether the nitric acid test was sufficient, he suggested the addition of Hubl's iodine absorption method, or one of its more recent modifications, and possibly as a quick means of obtaining evidence of adulteration, Hehner's bromine thermal test. In addition to these, the preparation of the free fatty acids and the determination of their melting and solidifying points would be sufficient to identify any genuine almond oil.

As to Dr. McWalter's question, he said that in addition to noting the immediate effect of the acids upon the oil, they always watched for the result of the reaction when the mixture had stood six or eight hours in a cool place. They had, indeed, attempted to show this in the duplicate tests exhibited upon the table, but the mixtures made six hours ago and cooled, had remelted whilst coming from their laboratory to Bloomsbury Square.

The authors were cordially thanked for their paper.

Mr. Perrédès gave a summary of the following paper, and illustrated it by a series of lantern slides:—

A CONTRIBUTION TO THE PHARMACOGNOSY OF OFFICIAL STROPHANTHUS SEED.

By Pierre Elie Félix Perrédès,

Pharmaceutical Chemist.

Historical Résumé of the "Kombé" Drug up to the Time of its Introduction into Medical Practice.

The discovery, in 1861, of the plant yielding the "Kombé" poison is due to Sir John Kirk, and has been described by him in the following words:—"The source of the poison, namely, *Strophanthus Kombé*, was first identified by me. I had long sought for it, but the natives invariably gave me some false plant, until one day at Chibisa's village, on the river Shiré, I saw the "Kombé," then new to me as an East African plant. (I had known an allied, or perhaps identical, species at Sierra Leone [1858], where it is used as a poison.) There climbing on a tall tree it was in pod, and I could get no one to go up and pick specimens. On mounting the tree myself to reach the Kombé pods, the natives, afraid that I might poison myself if I handled the plant roughly or got the juice in a cut or in my mouth, warned me to be careful, and admitted that this was the 'Kombé' or poison plant. In this way the poison was identified, and I brought specimens home to Kew, where they were described."[1]

The Rev. Horace Waller, who, like Sir John Kirk, was associated with Bishop Mackenzie's missionary expedition of 1861–64, also obtained some pods from a native chief in 1863, and these were brought to England by Sir John Kirk in the same year.

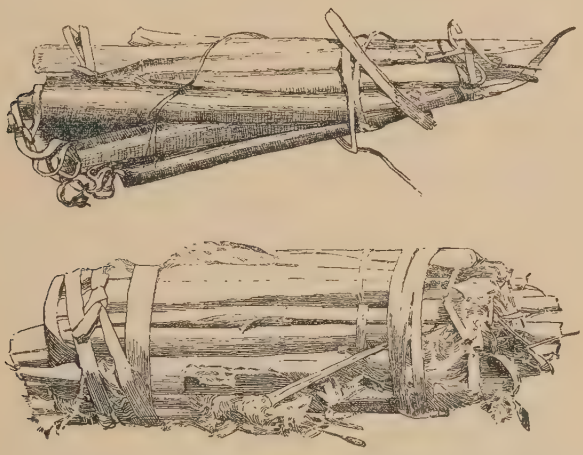
With these pods the first physiological experiments were made, by Dr. Sharpey in 1862–63, and by Messrs. Hilton Fagge, and Stevenson in 1865. These experimenters found that the Kombé arrow poison acted as a cardiac poison.

In 1869 the Rev. Horace Waller presented some specimens of ripe pods to the Materia Medica Museum of the University of Edinburgh, and these, together with additional material obtained from Prof. Sharpey and from Mr. John Buchanan, a Scotch missionary, constituted the supply which Dr. Thos. R. Fraser used

[1] Subsequent investigations have shewn that the "Kombé" seeds of commerce are probably derived from several species of Strophanthus, but the question is too much involved to be discussed here. Suffice it to say that, up to the present, no seeds have been obtained which are positively known to have been gathered from the plant *Strophanthus Kombé* (Oliver).

for his first investigations in 1870. While this investigation was in progress, Dr. Fraser received a poisoned arrow from the same district of Africa as the pods, and, by the physiological action of the poison on it, was enabled to confirm the discovery already made by Sir John Kirk of the source of the arrow poison.

In 1885 Prof. Fraser's communication to the British Medical Association meeting at Cardiff marked the epoch of the adoption of Strophanthus as a remedial agent, and is too well known to require further comment.[1]



TWO BUNDLES FROM THE FIRST CONSIGNMENT OF STROPHANTHUS WHICH REACHED THIS COUNTRY FOR COMMERCIAL PURPOSES. *From original photograph.*

(These blocks were kindly supplied by Messrs. Burroughs, Wellcome & Co.)

Realising the importance of Prof. Fraser's investigations, and anticipating the influence of these on medical practice, Messrs. Burroughs, Wellcome & Co. sent a trustworthy agent to the Kombé region,[2] and procured from the native huts the pods stored by the natives themselves for the purposes of arrow poisoning. This supply cost them more than £20 per lb., and constituted the first consignment of Strophanthus introduced for therapeutic purposes.

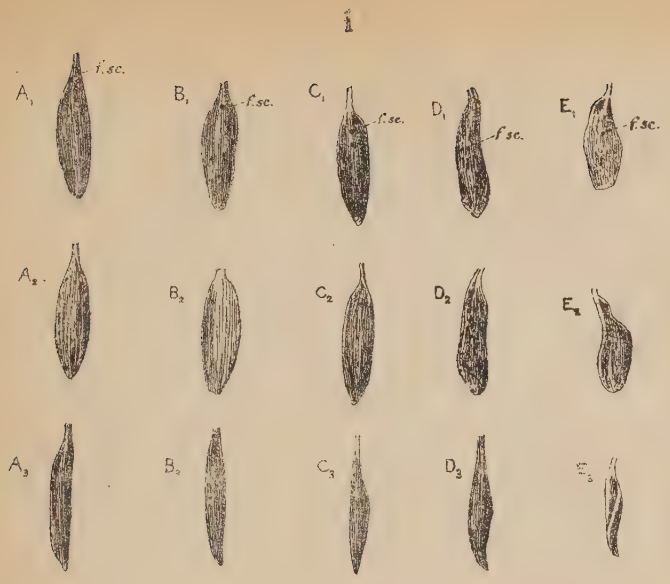
[1] I am indebted to Prof. Fraser's monograph for all the above information. The full title, etc., of this monograph will be found in the list of literature at the end of this paper, and the reader is referred to the original for an exhaustive account of the history of the drug.

[2] *Chemist and Druggist*, March 13, 1886, p. 172.

Examination of the Official Seed.

This investigation was undertaken in the first place with the object of determining, as far as possible, what morphological and histological differences exist between various Strophanthus seeds imported from Eastern Africa under the designation of "Kombé" seed. It was shewn by Mr. Holmes (*P. J.*, vol. xxiii., April and May, 1893, pp. 868 and 927) that the albumen and the cotyledons in the "Kombé" seed of commerce, and also in the seeds used by Dr. Thos. R. Fraser in his investigations, shewed striking differences when treated with concentrated sulphuric acid, the albumen and both cotyledons exhibiting in some seeds a red coloration; in others, the albumen and one cotyledon a green coloration, the other cotyledon a purplish one. Further variations were also shewn by other commercial seeds, but in every case the tints seemed constant for each variety. It was suggested that this might be due to the fact that the "Kombé" seeds of commerce are derived from different species of Strophanthus; to this supposition additional weight was given by Dr. Blondel's *Les Strophantus du Commerce*, where three distinct varieties of "Kombé" seeds were claimed to have been found on the market, and to be easily capable of identification by their histological characters. Furthermore, through the kindness of Mr. Holmes, I was able to examine the seeds from three different pods, each pod being obtained from a different district in East Africa. The seeds in one of the pods gave for the most part a green coloration with concentrated sulphuric acid (and these were regarded by Mr. Holmes as the official kind), while the seeds from the other two pods gave a red coloration with the same reagent. An attempt was therefore made to ascertain whether the structure would reveal any characters by which the seeds giving these different reactions could be distinguished. At the very outset, however, it was found that the seeds from one and the same pod exhibited differences among themselves as great as, if not greater than, those indicated by Dr. Blondel. In view of this, it was deemed advisable to examine the seeds from one pod as thoroughly as the means available would allow, and for this purpose those seeds in which the green coloration with concentrated sulphuric acid is the most prominent have been first dealt with, and constitute the subject matter of this paper.

The shape of the seeds is a somewhat variable quantity (Fig. 1); the general outline, although frequently oval (Fig. $1A_1$), may be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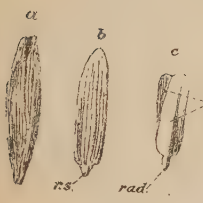
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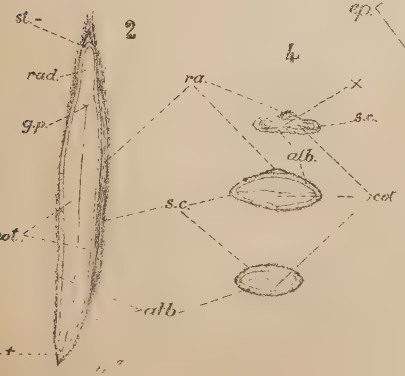
2
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sometimes almost ovate (Figs. $1D_1$ and $1E_1$), and even slightly obovate (Figs. $1B_1$ and $1C_1$); they are always acuminate. The size of the seeds, likewise, varies considerably, and, although I have only had a limited number of them at my disposal, I have found the length to vary from 12·5 to 17·5 mm., the width from 3·5 to 4·5 mm., and the thickness from 1·2 to 2·3 mm. The thicker seeds are usually straight, although this is by no means always the case (Figs. 1A, 1B, and 1C), while the thinner ones are generally twisted spirally (Figs. 1D and 1E). The base of the seed is terminated by a fine pointed, rounded, or truncated membranous wing (see Fig. 1), most clearly seen in a longitudinal section (w^s, Fig. 2). On the ventral surface[1] of each seed there is a longitudinal ridge extending from the apex to half or over two-thirds of the way down. This ridge, sharp and steep towards the apex, becomes flatter and wider towards the base in varying degrees, and may occupy a strictly median position, as in Fig. $1B_1$, but is more frequently deviated to one side towards the apex, either to the right, as in Fig $1E_1$, or to the left, as in Figs. $1A_1$ and $1C_1$; a further variation occurs in some seeds, where the ridge follows a somewhat wavy course, the deviation occurring first in one direction and then in the opposite one, as in Fig. $1D_1$. At some point on this ridge the scar of the funicle may be seen as a small white dot (*f. sc.*, Figs. $1A_1$, $1B_1$, $1C_1$, $1D_1$, $1E_1$), indicated in the figures by a *black* one; its position is very variable, being in some cases quite near the apex (Fig. $1A_1$), in others nearly at the centre (Figs. $1D_1$ and $1E_1$); more frequently, however, it is found at some point between these positions (Figs. $1B_1$ and $1C_1$). The dorsal surface is usually flat or slightly convex (Figs. $1A_2$, $1B_2$, $1D_2$), but sometimes conspicuously convex (Fig. $1C_2$) or slightly concave (Fig. $1E_2$); the ventral surface is either convex or nearly flat; in the latter case the median ridge stands out boldly (Figs. $1B_1$ and $1B_3$). The surface is covered with short, closely-appressed silvery hairs, directed towards the apex of the seed and arranged in longitudinal rows. The term "silky" which has been frequently applied to them is, although quite correct technically, somewhat misleading, as they are stiff and rigid, and resemble hog's bristles far more closely than they do silk fibres. This feature is seen with especial clearness if the hairs be examined under a good lens.

The colour of the seeds varies according to the position of the

[1] The term "ventral surface" is here used to denote that side of the seed which faced the placental surface of the follicle; the opposite side then becomes the "dorsal surface."

observer and of the seed with respect to the incident light. If a seed in which the hairs are in their natural position be placed at right angles to the incident light, and be viewed from the base, it will present a silvery appearance, with just a faint suspicion of a yellowish or grey-green tint; if, on the other hand, it be viewed from the apex under the same conditions, it will have lost all, or nearly all, its sheen, and will appear obviously green, greenish-fawn, or brownish-green. In intermediate positions intermediate tints are displayed. When the hairs are scraped off, the same tint as that exhibited by the inverted seed, viewed as above, is seen in all positions, a fact which tends to shew that the green colour of the seed is not due principally to the contents of the hairs, as has been generally supposed, but rather to the contents of deeper-seated layers.

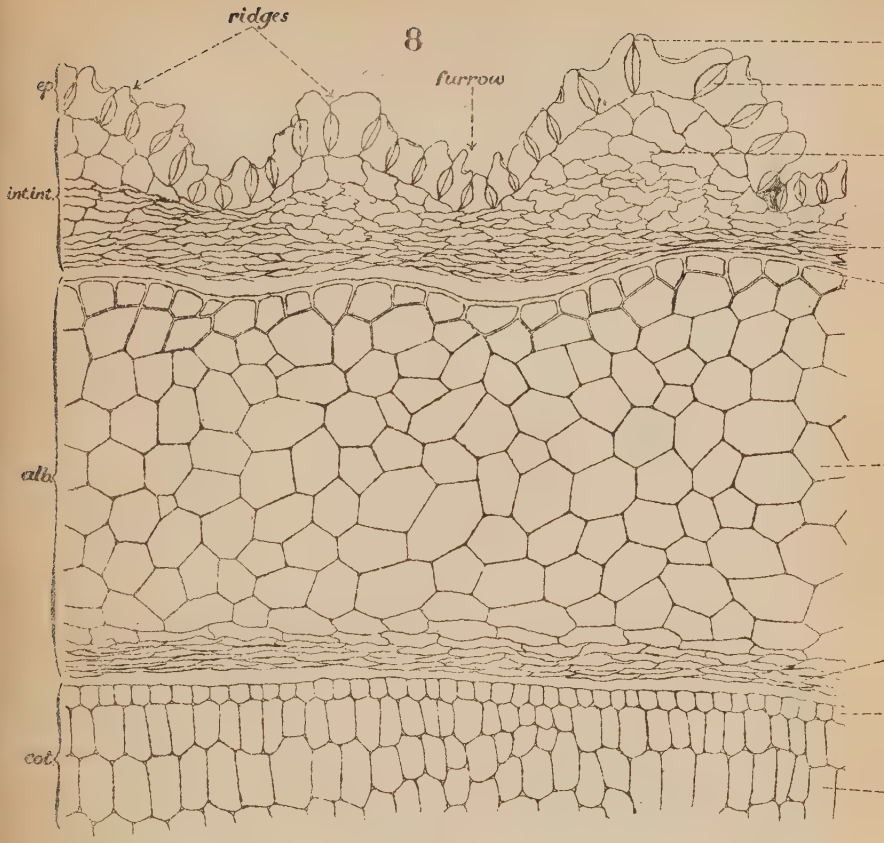
When placed in water the seeds, when left to themselves, float on the surface. They can be caused to sink by wetting them with the fingers, and after soaking they swell, and may be easily separated into three distinct portions, viz.:—

(1) The integuments of the seed (Fig. 3*a*).

(2) The albumen, consisting of a longitudinally-grooved, more or less bi- or plano-convex envelope, of cartilaginous consistence, narrowed into a rounded point towards both ends, gradually towards the extremity directed to the base of the seed, abruptly towards the other extremity (Fig. 3*b*).

(3) The embryo, consisting of two straight plano-convex cotyledons with their flat sides facing each other, and of a well-marked radicle fitting into the abruptly narrowed end of the albumen (Fig. 3*c*).

Transverse sections cut through different seeds in the regions where they most resemble each other (generally a little below the middle) are shewn in Fig. 5. The variations noted above in the thickness of the seeds and in the curvature of their surfaces are well shewn, while the central white core of the median ridge, here due to the vessels of the raphe, is also evident. Sections through upper, middle, and lower portions respectively of a well-developed seed are shewn in Fig. 4, and represent fairly well the variations which obtain, broadly, in most seeds. It will be observed, for instance, that near the apex the section is at its flattest, whereas it is relatively thickest near the base. At the periphery of a transverse section the hairy epidermal layer of the seed-coats is visible, and is subtended by a thin green line, the latter dividing at the raphe so as to form an internal, as well as an external,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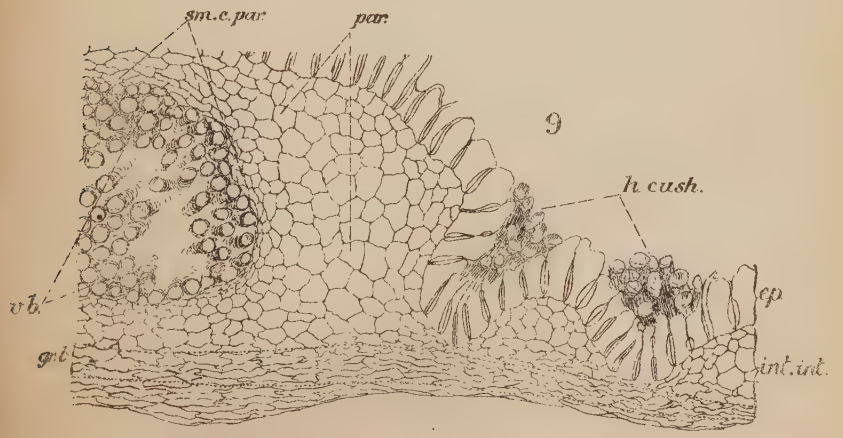
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border to it. Immediately under the above, which together constitute the integuments of the seed (*s. c.*, Figs. 2, 4, and 5), the albumen is situated (*alb.*, Figs. 2 and 4). It presents a somewhat translucent appearance in section. I have not found its average thickness to vary much in different specimens (see Fig. 5), although the local variations at different points of the same section are very considerable, as will be shewn later. Surrounded by the albumen, the two plano-convex cotyledons are seen, unless the sections have been cut near the apex of the seed, in which case the radicle alone will be visible. The cotyledons are always more opaque than the albumen, and vary considerably in thickness, being sometimes very much thicker than the latter (Fig. 5*a*), sometimes nearly as thin (Fig. 5*e*), but usually considerably thicker (Figs. 5*b*, 5*c*, 5*d*). In addition to these features, a longitudinal section at right angles to the plane of the two cotyledons (Fig. 2) shews the extent of the raphe (*ra.*, Fig. 2), the position of the growing point (*g. p.*, Fig. 2), the membranous wing (*w*^{s}., Fig. 2), and the upward direction of the epidermal hairs.

We will now proceed to examine in detail the structure of the integuments, albumen, and embryo.

The integuments of the seed, seen in a transverse section mounted in pure glycerin, shew two distinct regions (Fig. 6), an external one, composed of a single layer of cells and constituting the epidermis of the seed (*ep.*, Fig. 6), and an internal one, composed of several layers of compressed cells, and forming a narrow green band much thinner than the epidermis (*gr. l.*, Fig. 6). On inspection of Fig. 6 it will be seen that these integuments are thrown into numerous sharp folds and furrows, most of which follow similar irregularities in the albumen. In some cases, however, the folds consist only of integuments, the epidermis in such a case forming the external portion of the fold, and the inner layers its internal one (*f.*, Fig. 6). After soaking in water, or better, after mounting in chloral-hydrate solution, the outer cells of the green band just mentioned unfold at intervals, and give rise to an undulating outline (Figs. 7, 8, and 9 on the right). If the epidermis, separated by soaking in water, be examined in surface view, these undulations appear as ridges and furrows (Fig. 10), the latter being filled up by dense aggregations of the upwardly directed epidermal hairs, while the ridges are very much more sparingly clothed.

The structure of the epidermal cells shews a rich variety which seems, for some inexplicable reason, to have been overlooked by

previous workers, even by such eminent experts as Professor Hartwich, Professor Louis Planchon, and Dr. Hanausek, although the last came very near to giving the true explanation, which, unfortunately, he afterwards withdrew on the publication of Dr. Nevinny's researches.

In the simplest case, illustrated by the cells of the median ridge near the apex of the seed, we get a cell with its side walls strengthened by a yellow, lignified and striated hoop of thickening (*l. hp.*, Fig. 10′), which appears to be lined on its internal face by a delicate cellulose membrane. The outermost portions of these side walls, as well as the outer and inner walls of the cell itself, consist of cellulose. The outer wall is prolonged, generally at its upper end, into a short hair also consisting of cellulose (*h.*, Fig. 10′). In Fig. 11 a slight increase in complexity is shewn, together with a lengthening of the hair; here the region of lignified thickening is more extensive, and consists, in addition to the lateral hoop just mentioned, of a ring at the bend of the hair (*r.*, Fig. 11), and of an ascending band joining the hoop to the ring (*asc. b.*, Fig. 11), while the internal face of the hair on the side next to the seed-surface is floored by a lignified strip running along its entire length. The larger proportion of the epidermal cells, however, belong to the types shewn in Fig. 12 (perspective side view), Fig. 13 (longitudinal optical section), Figs. 14, 15, 16 (surface views, hairs broken off), and Fig. 17 (perspective surface view). In these the dome-shaped outer cellulose wall of the cell is usually traversed by two or more curved and lignified bands joining at the apex of the dome to form a ring (*r.*, Fig. 17), the latter being situated, as in the previous case, at the point where the cell becomes narrowed into the hair with a sharp bend; from the ring two or more branches arise and ultimately unite to form the more or less uniform, thickened and lignified strip running along the whole length of the internal border of the hair; the point of the hair is also frequently lignified internally. In Fig. 18 a hair is shewn as seen from the outer surface, and in Fig. 19 the fragment of another as seen slightly from the side. In Fig. 20 (optical longitudinal section), and in Fig. 21 (tangential section, perspective), cells are shewn in which bands of thickening occur in other positions also; these seem to be the "rafter-like" (*balkenförmige*) thickenings which Professor Hartwich observed in glabrous seeds from Lagos and Zambesi, but which he stated to be absent in the hairy varieties of Strophanthus. Such thicken-

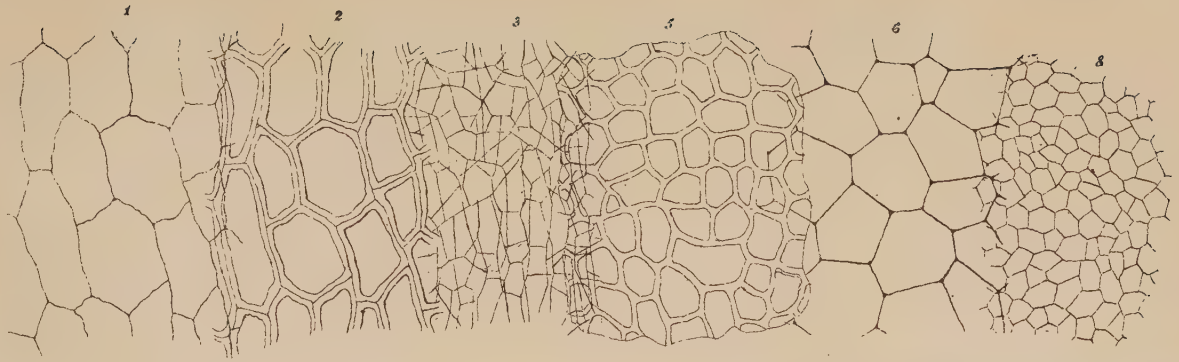
ings are certainly comparatively rare, but the ascending bands noted above might be looked upon as "rafter-like" thickenings. Other variations occur, but these are the principal ones.

The thickened hoop of an epidermal cell in longitudinal and transverse section appears as two yellow and striated areas, flat on their external faces where they were in contact with similar faces of adjoining cells, and convex in varying degrees internally (*hp. s.*, Figs. 10', 11, 13, 20). In the tissue itself these areas always appear more or less bi-convex (*hp. s.*, Figs. 22 to 27, *ep.*, Figs. 8 and 9), owing to the juxtaposition of their flat external faces. On the shape and relative height and breadth of these bi-convex areas as seen in tranverse section, and on their distance from each other, great stress has been laid by many pharmacognosists, as a means of distinguishing seeds of different origin, but it will be well to note that the variations which may occur, not only in seeds derived from the same pod, but even in the selfsame seed, are by no means inconsiderable. One of the most interesting of these variations is shewn by the cells situated in the furrows and on the ridges respectively, the side walls in the latter being, as a rule, further apart, and their lignified areas more strongly developed than in the former; the outline of these areas, moreover, is usually more sharply bi-convex in the furrows than on the ridges, where it is more nearly oblong in the middle portion, narrowing down only near the top and bottom; this general rule, as one might expect, does not hold with mathematical accuracy, as Figs. 23 and 24 clearly shew. It is to be noted, further, that when the section happens to pass through one of the ascending bands which is fairly upright, these lateral thickenings will naturally appear much more elongated and parallel-sided (*asc. b.*, Figs. 23, 25, and 13 longitudinal section). In sections which are not too thin one frequently sees the arch formed by two of these ascending bands on their way to the apex of the dome (see Fig. 26, where the inner thickened portion of the hair, *l.h.b.*, is also shewn in section). The lateral walls of the cells situated over, or in close proximity to, the greater part of the median ridge of the seed are close together, and their thickened portions are nearly always elongated and seldom much swollen, shewing a slightly fusiform outline at best (*ep.*, Fig 9 on the left); the ascending bands of thickening must be very numerous here, for a section through this region always shews a large number of the much elongated areas noted above (*ep.*, Fig. 9). In surface view the epidermis is seen to consist either of polygonal axially elongated (Figs. 14 to 17,

21 and 28), or nearly isodiametric (Fig. 29) cells, or of axially elongated ones with tortuous walls (Fig. 30). The yellow striated hoops of the side walls give to these cells the appearance of sclerenchymatous tissue, but careful focussing will reveal the curvature of these walls and also their outermost (here seen uppermost), thin cellulose portions, usually easily recognised by being somewhat wavy (*cell w.*, Figs. 8a[1], 14 to 16, and 21). Figs. 28 to 30 and Fig. 8a[2] represent ideal tangential sections through the thickest parts of the cells. It will be easily realised from these how very variable the distances between the longitudinal walls are (the section of the latter being, of course, those which are seen in transverse section). Fig. 30 is a very fair average of the cells which occur over the median ridge. The left-hand portion of Fig. 28 represents part of a ridge and the right-hand one of a furrow, the arrow indicates the direction of the slope from one to the other. It will be noticed that not only are the cells in the furrow more narrow than those on the ridge, but they are altogether smaller and consequently more numerous.

The other features of the epidermis visible in surface view, although more difficult of observation, can nevertheless be quite satisfactorily made out by careful focussing. The lignified bands, which run from the thickened hoop on the lateral walls to the apex of the cell, are best seen on the slopes, as they are frequently damaged on the ridges (Fig. 16), while in the furrows the overlying hairs hide them from view; the rings at the apices of the cells are, however, nearly always perfectly apparent. The hairs are also easily made out, their structure has already been described at some length, and the following particulars will be sufficient to complete the description. Their length varies usually from 0·5 to 0·8 millimetres, but they may be very much shorter, as, for instance, towards the apex of the seed, especially on the ventral ridge; these occasionally occur also mingled with the longer hairs on any part of the seed. I have never found any hair exceed a millimetre in length, although Dr. Nevinny found them to be several millimetres long in some (Kombé ?) seeds. When a hair is broken off, the separation takes place at the apex of the epidermal cell, at the place where the bend and the above-mentioned lignified ring occur, in such a way that the ring is carried away also, although the latter is not usually found in a hair which has been so broken off (Fig. 19), but it may be seen in Fig. 18 (which is somewhat exceptional in having the perfectly intact ring attached).

8a



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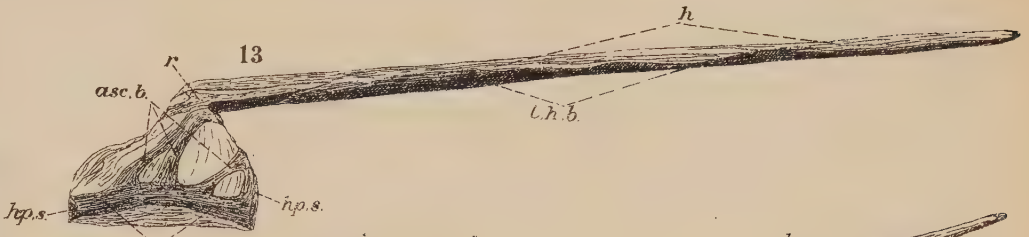

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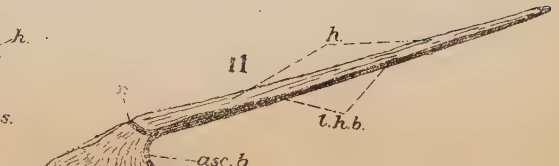


Plate II

Every epidermal cell, I think I may say without exception, possesses a hair, and we have seen that these cells are more numerous in the furrows than on the ridges. These two facts will help us to realise how the more or less regular aggregations of hairs in longitudinal rows come about, for not only will the floors of the furrows be more thickly clothed, but the hairs on the slopes of the ridges will also contribute to make of these furrows longitudinal cushions of superposed hairs. These observations have, of course, been made on seeds which had been soaked in water or otherwise swollen, but in the dry seeds the case would only be accentuated, inasmuch as the swelling of the seed-coats simply converts the sharp folds of the latter into gentle undulations.

There is still one point which is perhaps worthy of mention. The statement has been made by Dr. Blondel, and corroborated by Professor Louis Planchon, that the outer walls of the epidermal cells are frequently so shrunken that they touch the inner ones. I have observed this in comparatively rare instances only, and these almost entirely limited to transverse sections. If a transverse section stained with hæmatoxylin be examined, a possible explanation of this appearance is found (Fig. 27); here this apparent dip is certainly due to the hoop seen in optical section, for its light yellow colour stands out boldly from the blue line due to the remains of the outer cellulose portions of the walls. The only reason I can suggest, for this apparent inward dip of the outer margin of a more distant portion of the hoop, is that this portion has been pushed inwards by the razor in cutting the section, or else that the portion nearer to the observer has been pulled outwards.

The remaining layers of the seed-coats consist entirely of thin-walled cells, compressed at right angles (except in some of the folds) to the surface of the seed; when examined in pure glycerin they appear merely as a pigmented band whose component elements cannot be made out; after soaking in water for some time, however, or after treating with chloral-hydrate solution, considerable unfolding of the cell-walls takes place in certain regions, giving rise, in transverse section, to the wavy outline already mentioned and shewn in Fig. 8 and 9 (*Int. int.*). All the cells seem to be very much alike, and to differ mainly in the amount of unfolding which they have undergone after soaking (although the cells immediately under the epidermis are frequently smaller in size); they have very thin cellulose walls and slightly but distinctly thickened

corners; when completely unfolded, as they frequently are in the cores of the ridges, they shew a polygonal outline in transverse section (Figs. 8 and 9), and also in a radial longitudinal (Fig. 31), and in a tangential one (Fig. 32); it is very difficult, however, to get satisfactory radial and tangential sections, for the cells are so wedged in between each other that the walls of an increased number of them come to be very nearly in the same plane, giving rise to the appearance shown in Fig. 8a[3]. The general arrangement of the various layers, in a soaked seed, is somewhat as follows: the innermost layers of cells are not well defined, and appear to be somewhat mucilaginous; between these and the exterior we get a fairly continuous band consisting of several layers of slightly expanded cells which persistently retain their green or brownish-green pigment; this band grazes the epidermis in the furrows, but its limit is not very well marked under the ridges, for here the outer cells merge gradually into the looser arrangement which obtains in the folds. Intercellular spaces are absent throughout. Under the median ridge the same three regions are seen with especial distinctness, the middle pigmented band (*gr. b.*, Fig. 9) being here sharply marked off from the innermost colourless layers and from the outer well-developed loose tissue (*par.*, Fig. 9); in the latter, the vascular strand of the raphe is situated, if the sections be taken below the insertion of the funicle (*v. b.*, Fig. 9). This vascular strand consists of small spiral vessels running in a more or less longitudinal direction; its border is joined to the surrounding loose tissue by a zone of delicate small-celled parenchyma (*sm. c. p.*, Fig. 9). With regard to the occurrence of spiral vessels, I can confirm Professor Hartwich's observation, which is that they are entirely confined to the raphe. I have not been able to find any indications whatever of laticiferous tubes in any part of the seed-coats, although I have carefully looked for them; these were found by Dr. Blondel in the closely related "hispidus" seeds, where their presence was emphasized by him in the following words:—

"*Il (le second tégument séminal) est formé d'éléments aplatis, fusiformes, à parois très minces, souvent sinueuses, ce qui leur donne, lorsqu'elles sont parallèlement accolées, l'aspect d'un écheveau ondulé ou d'un laticifère tortueux à paroi plissée. Or, précisément, il y a des laticifères dans cette couche, si bien qu'il devient souvent très difficile de les voir, ou plutôt de ne pas prendre pour des laticifères ce qui n'en est pas. Ils existent toutefois très réellement, fait rarement observé, à notre connaissance,*

dans les téguments séminaux ; dans les points ou le tégument primaire, soulevé par un pli, laisse un peu de laxité à la seconde couche, on distingue nettement leurs contours, leur paroi mince, leur contenu brun ; ils deviennent surtout évidents, à la face ventrale, au niveau de la crête médiane qui continue le funicule. . . ." [1] This observation was confirmed by Professor Smith Ely Jeliffe who found "laticiferous vessels" in this tissue (and apparently in both "Kombé" and "hispidus" seeds).

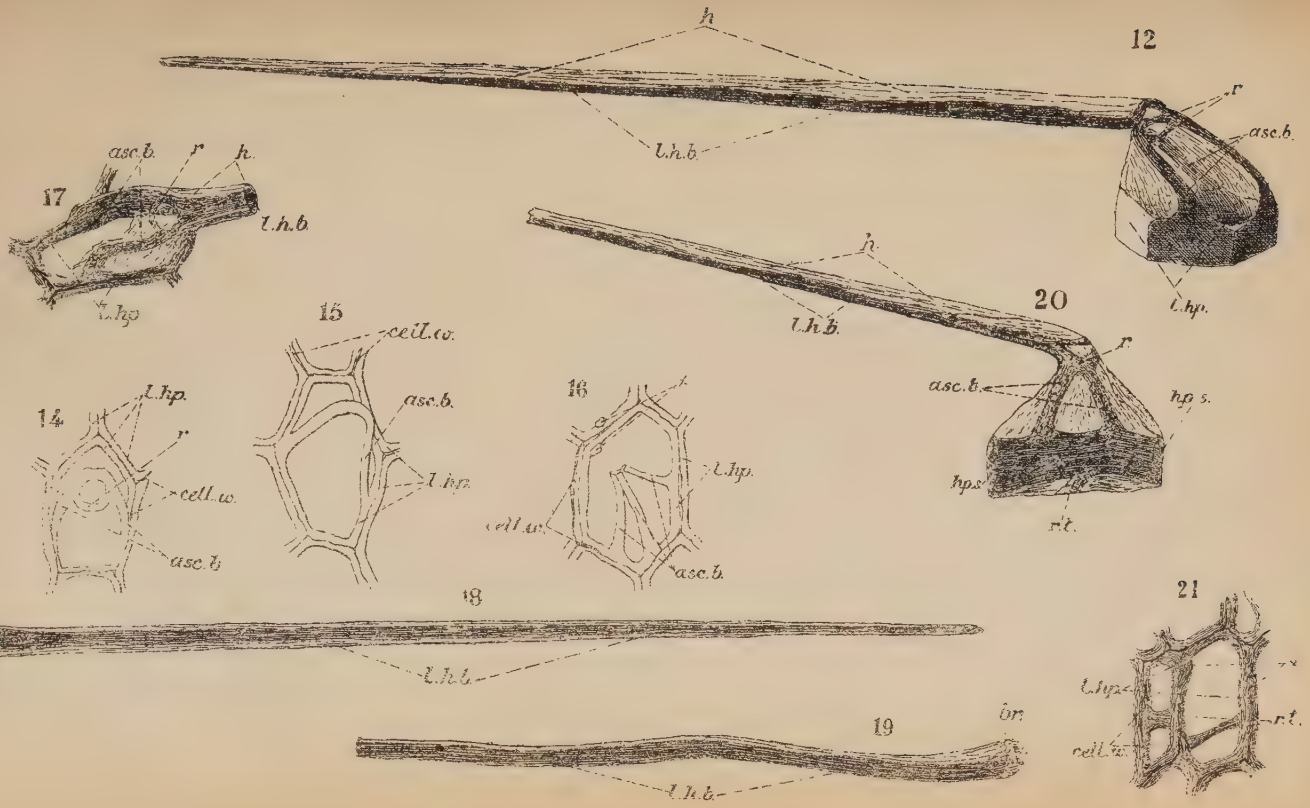
The albumen will next be considered. A transverse section through a dry seed, mounted in glycerin (Fig. 6), shews its external outline to be exceedingly irregular, owing to the presence of grooves and ridges as in the integuments; after soaking, these irregularities become less pronounced, although they still remain very noticeable (see Figs. 7 and 8, which represent a very good minimum of irregularity). It may be advisable at this point to remind the reader that the surface of the albumen, soaked out as in Fig. 3*b*, always appears grooved, whereas the integuments appear more or less even, this latter condition being due, as has already been pointed out, to the filling up of the furrows by epidermal hairs.

The outermost layer of the albumen consists of cells which appear rounded-polygonal, gelatinous and fairly thick-walled in surface-view (Figs. 8a[5] and 34), more or less cubical in radial-longitudinal and transverse sections; from Fig. 8[5], which was sketched from a section cleared in chloral-hydrate, it will be seen that only the outer walls are uniformly thickened, the lateral ones thinning down like wedges towards the interior. The remaining cells of the albumen, with the exception of those forming the innermost layers, are polygonal, thin-walled, and very slightly thickened, if at all, at the corners (Figs. 8[6], 35, 36, 37); in tangen-

[1] The following is an attempt to translate this somewhat difficult passage:—"It (the second integument of the seed) is formed of flattened fusiform elements, with very thin walls which are frequently sinuous, this giving them, when they are joined in a parallel manner, the appearance of an undulating skein or of a tortuous laticiferous (tube) with a wrinkled wall. Now, it so happens that there are laticiferous (tubes) in this layer, so that it is often a difficult matter to see them or rather not to mistake other structures for laticiferous (tubes). They are, nevertheless, certainly present, a state of things seldom observed, as far as we are aware, in seed integuments; in the places where the first integument, raised by a fold, allows a little looseness to the second layer, one clearly distinguishes their outlines, their thin walls, their brown contents; they become especially evident, on the ventral surface, at the level of the median ridge which forms a continuation of the funicle. . . ."

tial (Fig. 8a[6]), and in radial-longitudinal sections they present exactly the same features. In no case have I been able to detect unequivocal examples of intercellular spaces. The innermost portion of the albumen consists of several layers of much compressed and somewhat mucilaginous cells, very similar to those forming the internal limit of the integuments. What has just been said seems, at first sight, perfectly simple and straightforward, but, as a matter of fact, these albumen cells have given rise to a refreshing variety of opinion among different workers; for instance, Dr. Hanausek described them as "polygonal, exceedingly delicate-walled and closely fitted together," while, according to Dr. Nevinny, they are "isodiametric or somewhat tangentially elongated, and possess colourless, shining collenchymatous walls" (Fig. 38). Dr. Blondel, on the other hand, succeeded in finding no less than three different kinds of cells in three corresponding varieties of Kombé seeds; in the first variety these were stated to be "rounded with extremely thin walls" (Fig. 39), in the second, "rounded with tolerably thin walls" (Fig. 40), and in the third, "rounded and moderately (*médiocrement*) thick" (Fig. 41). Professor Hartwich, in his first paper, found them to be "fairly large and thin-walled," while in his second one, the cell-walls of the embryo, in Strophanthus seeds generally, were stated to be "thin when compared with those of the endosperm" (see Fig. 42). Dr. Fraser published no description of the structure of the seeds, but he gave figures in which the walls of the albumen cells were depicted uniformly thin in some cases (*thn.*, Fig. 48), in others uniformly thick (*thk.*, Fig. 43), in others still, irregularly thickened (*irr.*, Fig. 43). Finally, Professor S. E. Jeliffe figures them as "polyhedronal" and fairly thin-walled (about as in Fig. 33), and also mentions the fact that two of Blondel's three types were observed by him. Now, it is possible to get a good deal of variation in the same section according to the conditions of observation. An account of various observations made under different conditions, and with different reagents, will accordingly be given.

In a moderately thin section, cleared with chloral-hydrate, the cell-walls appear thin, as has already been stated, but in a somewhat thicker section some of the walls appear thick, especially if the contents have not been thoroughly cleared; if a section which has been thus treated be deeply stained with hæmatoxylin, we get a suggestion as to the reason for this thick-walled appearance (see Figs. 35, 36, 37). It is here seen that the walls are more or less wavy (*ps.-t.*, Figs. 37), or slanted, and by careful focussing the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cell.w.

Plate IV.

section of the actual wall, which might at first be taken for a middle lamella, is seen to swing from one side to the other; where some of the cell-contents have been preserved, the appearance is exceedingly deceptive (see Fig. 37). Seeds which have been soaked in water give similar results. When the transverse section of a dry seed is examined in pure glycerin most of the cells are seen to possess considerably creased walls (Fig. 44), and to present in some places a uniformly thick-walled and gelatinous appearance, in others the walls appear quite thin, and in others still, they appear to be irregularly thickened—this agrees quite well with Dr. Fraser's figure. If the section be now treated with chloral-hydrate, it will be noticed that the walls stretch out, so that the creases come to be represented by the undulations noted above, these curvatures being retained more especially by the walls lying at right angles to the plane of the section. With water, the same features can be observed, but only after some time, as the action is slow; it is necessary, moreover, to get a very thin section, as otherwise the disintegration of the cell-contents will obscure the result. I have not been able to observe any considerable *swelling* of the cell-walls in the last two cases, but it is, nevertheless, probable that the cellulose of these walls has undergone some modification, for they appear more gelatinous and highly refracting than ordinary cellulose, and are stained red by a solution of Ruthenium red in 10 per cent. aqueous lead acetate;[1] the last-named reagent, moreover, seems to make the cell-walls more opaque, and the cells of a section, mounted directly in this medium, accordingly present the thick-walled appearance at its best. In Fig. 45 the action of potash is shewn. In all these cases, except the last, it should be specially emphasized that the cell-walls do not appear thick *if the section be thin enough.*

These are the general features of the larger number of the albumen cells; the modifications exhibited by the cells of the outer and inner layers have already been briefly mentioned and need no longer detain us, but a few additional minor details may not be inappropriate. The cells, in the sharply curved portion of the albumen at the lateral edges of the seed, are very

[1] This reagent, which was very kindly brought to my notice by Prof. Greenish, has been recommended for the detection of mucilage, and although it probably stains other substances, it has done me good service, inasmuch as it affects all the unlignified walls of the seed in the same way as above, whether they belong to the epidermis or to the inner layers of the seed-coats, to the albumen, or to the embryo, whereas it leaves most of the cell-contents unstained

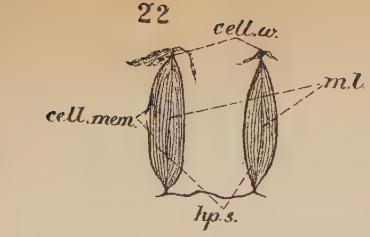
often tangentially elongated (*i.e.* flattened at right angles to the surface of the seed), and sometimes slightly thickened (see Fig. 33, which was sketched from a cleared section). The cells of the albumen, situated under the raphe, are seldom much creased, and appear thin-walled under any conditions.

As in the seed coats, I have found laticiferous tubes entirely absent, although the puckering of the gelatinous outer surface may form in certain places gutters which, at first sight, look like thick-walled and striated tubes. A very remarkable case in point is shewn in Figs. 34 and 46 *vr.*; this was found on the outer surface of the albumen, just over the tip of the radicle, the section being a somewhat oblique longitudinal one, which had just grazed the surface in question. Fig. 47 is an end view of the outer surface of that part of the albumen which covers the root-cap; from an inspection of this figure it will be seen how a case such as that shewn in Figs. 34 and 46 might arise.

In describing the embryo the cotyledons will be first dealt with, then the radicle.

The cotyledons have, as already stated, a planoconvex outline in transverse section. At about the central point of each one of them a more or less semilunar series of procambial strands occurs (*proc.*, Fig. 6), while lateral branches, cut through at varying angles, are seen making their way to the margins of the cotyledon (*latl. b.*, Fig. 6). Around the central procambial series delicate laticiferous tubes are present (*lat. t.*, Fig 49), which are most abundant on the outer convex side; not infrequently they may be also seen accompanying the lateral branches or making their way to the external, or, more rarely, to the internal border of the cotyledon. Between the two cotyledons there is frequently a pad of mucilage (*mu.*, Fig. 6).

The outer epidermis of each cotyledon consists of small thin-walled cells which are cubical when viewed in transverse (*out. ep.*, Fig. 49) and longitudinal sections (*out. ep.*, Fig. 50), polygonal in surface view (Fig. 8a[8]). The inner epidermis is similar (*in. ep.*, Fig. 49), but radial elongation (*i.e.* elongation at right angles to the plane of the cotyledon) frequently occurs here. In both cases the external walls have a tendency to be mucilaginous and slightly thicker. The cells of the ground tissue are polygonal in outline and extremely thin-walled (see Figs. 49, 50, 54 to 56); distinct intercellular spaces are present. The direction of greatest elongation in these cells varies somewhat, but it may be stated broadly, that they are axially elongated in the midrib (*par.*, Fig. 50), and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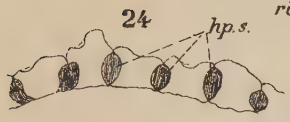
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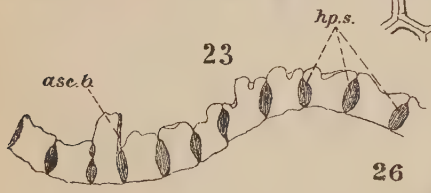
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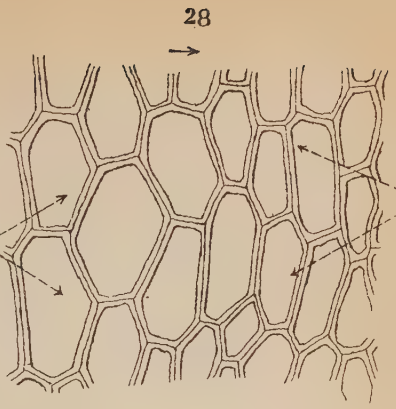
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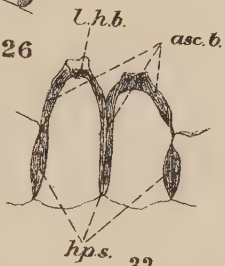
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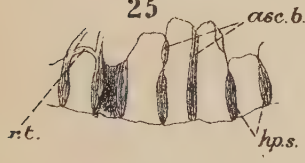
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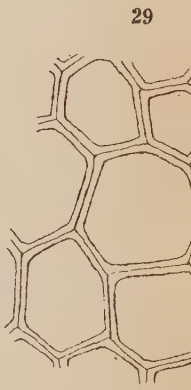
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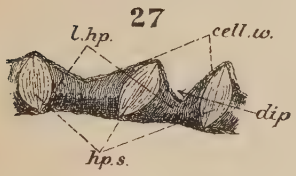
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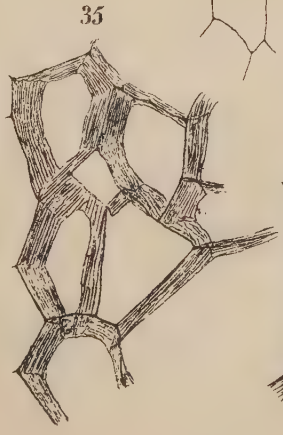
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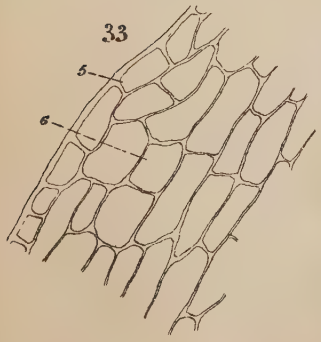
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radially elongated elsewhere, especially in the inner half of the cotyledon.

The elements in the area enclosed by the circle-segment, of which the procambial strands form the arc, are axially elongated and of small cross-section; the procambial strands themselves are evident as groups of exceedingly small-celled prosenchymatous elements (*proc.*, Fig. 49).

The laticiferous elements[1] consist of somewhat sinuous unsegmented tubes, which branch but do not anastomose (*lat. t.*, Figs. 49 and 50); around the growing point of the stem they form a dense felt (*lat. w.*, Fig. 48), which, in tranverse section, appears exceedingly like a web of mycelial hyphae; their walls have a gelatinous and somewhat swollen appearance when mounted in glycerin (Fig. 52) or chloral-hydrate (Fig. 51). Ruthenium red in lead acetate solution colours them bright red. All attempts to isolate these structures have proved abortive; I have only obtained small continuous fragments at best.

The radicle is terminated by a well-marked root-cap (*r.c.*, Fig. 48). Its ground parenchyma consists of exceedingly thin-walled isodiametric cells, smaller than those of the cotyledons. Distinct intercellular spaces are present. The procambial strands consist of prosenchymatous elements, similar to those found in cotyledons; these strands form a hollow cylinder, which appears as a ring in transverse section and as two parallel bands in longitudinal section (*proc.*, Fig. 48). Around the external margin of this hollow cylinder numerous laticiferous tubes occur; these run longitudinally for the most part, although a branch may be occasionally seen making its way to the exterior; branching, however, is much less common here than in the cotyledons.

The cell contents.—These are best defined and most easily made out in the cells of the embryo, which will, accordingly, be taken first.

A cell of the general parenchyma of a cotyledon, sketched from

[1] The laticiferous tubes of the natural order to which Strophanthus belongs (Apocynaceæ) have been shewn to be multinucleate structures, and therefore not true "elements." In modern English text-books these tubes are known as "cœnocytes," Van Tieghem calls them "*articles*." Before their multinucleate condition was made known they were looked upon as true elements or laticiferous "cells," and this is the term used by de Bary in his *Comparative Anatomy of the Phanerogams and Ferns*, pp. 190–199. To this work the reader is referred for a complete and remarkably accurate account of laticiferous tubes and their development. It is hardly necessary to add that I have not attempted to establish the "cœnocytic" character of these tubes in the seeds under examination.

a section mounted in pure glycerin, is shewn in Fig. 56; if such a section be examined as soon as it is mounted, the contents are seen to consist of rounded-polygonal, highly refractive bodies (*al.*, Fig. 56), embedded in a hyaline ground mass (*g.m.*, Fig. 56); small starch grains are also present in variable quantity, but oil drops are invisible as such. If the section be treated with ether before mounting in the above medium, no very noticeable change is observable, and I am totally at a loss to understand how the large vacuoles figured in Plate VI., Fig. 8, of Dr. Fraser's monograph can have come about; in water, disintegration of the cell-contents takes place, and the whole field becomes crowded with innumerable oil drops. It will be advantageous, at this stage, to examine each of these items separately, and in some detail; they will be dealt with in the following order:—

1. Ground-mass, including oil.
2. Aleurone grains (the rounded-polygonal refractive bodies noted above).
3. Starch.

1. The ground-mass consists of the oily protoplasmic network in which the solid bodies are embedded; somewhere in its substance the nucleus (*n.*, Fig. 55) is found. The oil occurs in very intimate connection with the protoplasm, and perhaps in actual chemical combination with it, for with the highest powers at my disposal I have been unable, in a glycerin mount, to detect the slightest indication of oil drops; water seems to destroy this combination, hence the appearance of oil drops with aqueous media. If a section, deprived of its oil by means of alcohol and ether, be warmed with chloral-hydrate solution, and subsequently stained with hæmatoxylin, it is occasionally possible to get a cell in which the protoplasmic remains are apparent as an exceedingly delicate network (Fig. 55). A better reagent still than chloral-hydrate is concentrated aqueous sodium phosphate, which dissolves the aleurone grains completely, but not the protoplasmic network, nor the starch. In thin sections the localisation of the oil can be made out with tincture of alkanet, or even with a 1 per cent. aqueous solution of osmic acid; for although in the latter case oil drops separate out and obscure the reaction, yet the unstained aleurone grains *in situ* stand out fairly well.

2. The aleurone grains, examined at once in slightly diluted glycerin, appear as homogeneous, rounded-polyhedral, highly refracting bodies (Fig. 57); but if left in this medium for a short time, solution gradually takes place from the outside to the interior,

and only minute rounded bodies (globoids) enclosed in a membrane are left behind, as pointed out by Prof. Hartwich (see Fig. 59). A similar result is arrived at with very dilute potash, but in this case the effect is instantaneous and more sweeping, for as soon as the reagent reaches the grain its contents swell and the membrane bursts, liberating the contained globoids. Alcoholic iodine stains the aleurone grains brown; iodine water does also, but in irregular patches (Fig. 58); Millon's reagent colours them red: their size varies from 2μ (0·002 mm.), or less, to 15μ (0·015 mm.), but the usual range is from 7·5μ (0·0075 mm.) to 10μ (0·01 mm.); in the larger grains the globoids are numerous, whereas in the small ones they may be solitary (Fig. 59); crystalloids are absent throughout. All observations with aqueous reagents should be made on sections which have had their oil removed, as the latter forms a great hindrance to the study of the aleurone grains.

3. The starch grains may occur in considerable abundance in some cells, notably in those of the parenchyma of the midrib; they are always very small, but can be made quite evident with a solution of iodine in chloral-hydrate (Fig. 54).

The contents of the laticiferous tubes are finely granular, and, together with those of the procambial strands, are stained deep red by Ruthenium red in lead acetate; this behaviour is exceedingly convenient, as it enables one to determine the distribution of these structures. Another fact which this reagent makes evident is, that along the line joining the ends of the procambial arch there is a series of elements with darkly staining contents; these elements are possibly the rudiments of an internal bast.

We now come to the most difficult part of our task, viz., the examination of the albumen cell-contents.

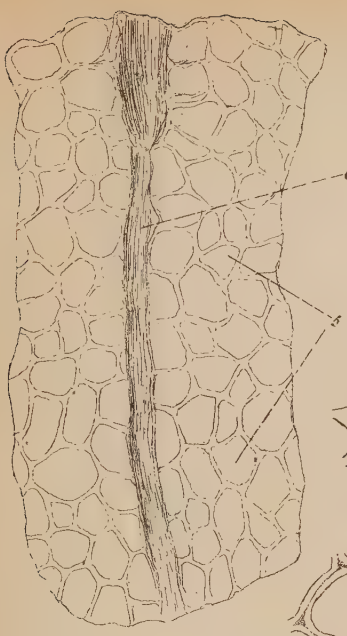
From Figs. 44 and 53 it will be seen that the cell-contents are chiefly limited to a layer lining the walls of the cells, although it is quite easy to find cells in which bridles are seen traversing the central vacuole (*br.*, Figs. 37 and 53); this central space appears to be quite empty, and I have repeatedly tried oil and mucilage reagents without avail. The protoplasmic ground-mass has a peculiarly stringy and gelatinous appearance, and is, in the dry seed, closely attached to the wrinkled cell-wall (Fig. 44). It resists the action of chloral-hydrate to a considerable extent, and, when this reagent is applied as directed above in the case of the embryo, subsequent staining brings out the details shewn in Fig. 37. Under these conditions it no longer remains in contact with the cell-walls, the latter having expanded more than the ground-

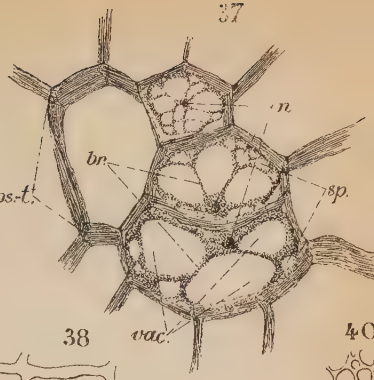
mass itself; the oil is intimately bound up with it as in the embryo, and no oil drops are visible in a glycerin mount. Embedded in this gelatinous substance, numerous starch grains occur (*st.*, Fig. 53); the size of these may vary from 10μ (0·01 mm.) to minute specks too small for measurement; the latter are generally grouped together round the nucleus (*lit. st.*, Fig. 53); the larger ones are distributed throughout the whole protoplasmic layer, and may be ovoid, nearly triangular, kidney-shaped, or club-shaped (Fig. 60). In the centre of each grain there is usually a depression, which becomes quite evident when the grains are treated with iodine in chloral-hydrate (Fig. 61). The distribution of starch in the albumen is somewhat as follows: The greatest development occurs at the base of the seed, the least at the apex and under the raphe; it is usually more abundant at the lateral edges than on the flat surfaces. In all these places it is most abundant in the middle portion of the albumen, diminishing appreciably towards the exterior, and very considerably towards the interior.

Besides starch, proteid bodies,[1] which look very much like aleurone grains, occur embedded in the protoplasmic ground-mass; these are shewn in Fig. 62. Some of them appear to contain crystalloids as well as globoids. They are usually more variable in size than those of the embryo, and may attain 13·75μ (0·01375 mm.), but seldom exceed 10μ (0·01 mm.). They are best seen after warming a section, deprived of its oil, with Millon's reagent. In any case the existence of aleurone grains in such highly vacuolated cells is suspicious, to say the least, and I cannot help thinking that there is something here which still requires explanation.

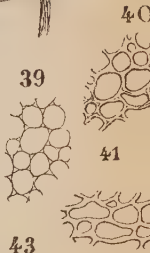
The contents of the seed-coats are principally mucilage, and green or brownish-green pigment. Both of these substances are contained almost entirely in the sub-epidermal layers; the mucilage in the cells that expand on soaking, and also in the innermost layers; the pigment, which probably consists of chlorophyll, in all the cells to some extent, but especially in the region which has

[1] Everyone who has published a description of the structure of Strophanthus seeds admits that they contain proteids or aleurone grains in the albumen, but there the agreement ends. Prof. Hartwich says in his second paper that he has found the aleurone grains of Strophanthus agree point for point with Herr Lüdtke's leguminous type. Now, I have read through Lüdtke's leguminous types in *Pringsheim's Jahrb.*, and also in the *Berichte der Pharmaceut. Gesellschaft*, and the only reference I can find to albumen (endosperm) cells is to the "*Aleuronschicht*" or outermost layer only of the albumen (endosperm) where the aleurone grains are very small, and have no inclusions.


34
wr.
b


37
n.
br.
ps-t.
sp.
vac.

38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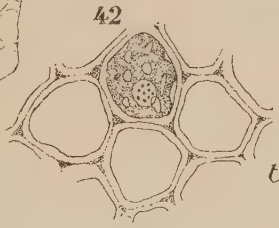
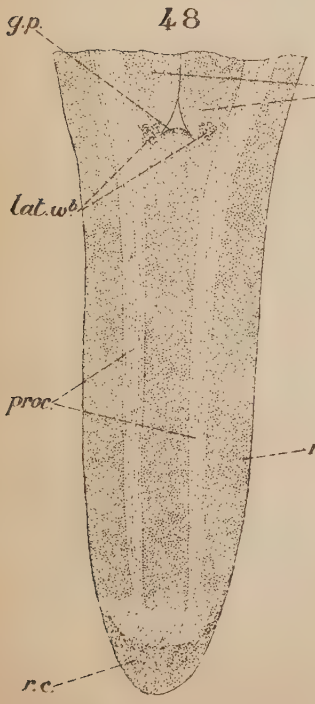

42

43
th^k
th^n


g.p.
48
col
lat.w^b
proc.
rad.
n.c.

44
gel.gm.
vac.

45

46
wr.
alb.
proc.

47
wr.

been previously indicated. The contents of the epidermal cells and of the attached hairs are insignificant. I have, indeed, occasionally observed a few chlorophyll grains in some cells, but these are very scanty at best, and most frequently they do not occur at all.

Calcium oxalate crystals are absent from every part of the seeds under examination.

The Sulphuric Acid Reaction.—The sections when treated with concentrated sulphuric acid invariably exhibit an unequivocal green coloration in the albumen, but the behaviour of the cotyledons is far from constant. In many cases both cotyledons, after a minute or two, become some shade of green, but it is very seldom that they are both tinted exactly alike. In some seeds, on the other hand, the cotyledons, under the same conditions, exhibit red mottlings distributed through the green mass, and in others one cotyledon became olive-green while the other cotyledon exhibited a magenta-red colour. These irregularities had been pointed out by Profs. Louis Planchon and Schlagdenhauffen,[1] and their observations appear to be as accurate as they are remarkable. It is evident from this that there is some close connection between the green reaction and the red one, and also that seeds shewing different colour reactions in the cotyledons alone, need not *necessarily* belong to different species. The epidermal cells of the seed-coats become dark brown in this reagent, and the lignified portions of their walls enormously distended; the brown colour is probably due to the charring of the lignified portions.

In the albumen the green-staining portion appears to be the protoplasmic ground-mass, but, owing to the swelling and distortion of the tissues, precise determination of this fact is not possible. In the embryo an expression of opinion, based on observations of the sulphuric acid reaction, resolves itself into little more than mere guess-work; still, it is not unreasonable to suppose, as Dr. Nevinny has done, that here, as in the albumen, the reacting principle is contained in the protoplasm. This supposition is confirmed by the fact that the oil, the aleurone, and the starch, when dealt with separately, are not affected in this way.

[1] See *Sur un Strophanthus du Congo français.* Par MM. les Professeurs Schlagdenhauffen et Louis Planchon, 1897, where an account of all the work that has been done on the colour-reactions of a large number of seeds will be found.

Summary and Conclusion.

An examination of typical East African "Kombé" seeds, all obtained from the same pod, reveals the following facts:—

The seeds vary considerably in size and shape. A ventral, more or less median ridge, extends from the apex of each seed to half or over two-thirds of the way down; somewhere on this ridge the funicle-scar is found, but its position is variable. The hairs on their surfaces are stiff and silvery, point upwards, and are arranged in longitudinal rows. The colour of a scraped seed is some shade of green or brown-green, that of the intact seeds varies with the position of the observer with regard to the seed and to the incident light, this being due to the disposition of the hairs. By soaking, the seeds can be separated into three distinct portions —seed-coats, albumen, embryo—whose details can be observed. The seed-coats and the albumen are longitudinally ridged and grooved; the grooves in the seed-coats are filled up by the upwardly directed epidermal hairs. The cells of the epidermis of the seed-coats shew, on careful examination, considerable variations, and, in most cases, a more complicated structure than has hitherto been supposed; their hairs never exceed one millimetre in length; the appearance presented by their side walls in transverse section, although doubtless of diagnostic value, is far from uniform, and should be taken into consideration in comparing different varieties of Strophanthus seeds. The sub-epidermal layers of the seed-coats, in a soaked seed, may be roughly divided into three regions—a thin inner mucilaginous strip, a middle pigmented band, irregularly arranged loose outer aggregations occurring only under the ridges. The cells of all these layers have very thin walls and thickened corners; intercellular spaces are absent. Under the ventral median ridge of the seed these three regions are well marked, and in the outer loose tissue, below the insertion of the funicle, the spiral vessels of the raphe are situated. Spiral vessels occur nowhere else in the seed-coats, and I have found no evidences of laticiferous tissue. The cells of the albumen present very different appearances according to the conditions of observation, but it is very probable that they are polygonal and thin-walled, with the exception of those of the outermost layer, whose outer walls are thickened, and of those constituting the innermost compressed layers. The embryo consists of two straight plano-convex cotyledons, joined by a well-marked radicle directed towards the apex of the seed; laticiferous tubes occur whose distri-

bution is conveniently made out with Ruthenium red in lead acetate. The cells of the embryo contain aleurone grains and oil in abundance, the latter not visible as such till the section be treated with aqueous reagents; starch also occurs in very small grains, especially in the midribs of the cotyledons. The contents of the albumen are similar to those of the embryo, but more scanty and, with the exception of the starch, difficult to make out; large vacuoles are present; the starch grains may attain 0·01 mm. The pigment of the seed-coats is probably chlorophyll. The action of concentrated sulphuric acid is constant in the case of the albumen, but variable in that of the embryo; the former always exhibiting a green colour in this reagent, the latter varying shades of green, green mottled with red, or green in one cotyledon and red in the other. The taste of the seeds is intensely bitter.

From what has been said it will be seen that these results are most disappointing, inasmuch as every histological character upon which the identification of the different varieties of "Kombé" seeds has hitherto been based, is found, almost without exception, to exist in seeds obtained from one and the same pod; and although I approached the question with every prejudice in favour of Dr. Blondel's conclusions, I have unwillingly been compelled to abandon them one after the other.

In conclusion, I desire to thank Dr. F. B. Power and Professor H. G. Greenish for the advice and assistance they have given me upon the many matters about which I consulted them. To our esteemed president, Mr. E. M. Holmes, F.L.S., I am especially indebted for invaluable help and for kind suggestions during the progress of this investigation.

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MM. G. Planchon et E. Collin, "Les drogues simples d'origine végétale," tome premier, p. 706, Paris, 1895.

Prof. Smith Ely Jeliffe, M.D., "Some Observations on the Strophanthus Seeds of the American Market." *Druggists' Circular*, vol. xl., No. 5, New York, May, 1896.

MM. les Professeurs Schlagdenhauffen et Louis Planchon, "Sur un Strophanthus du Congo français (Strophanthus d'Autran). Étude de chimie et de Matière médicale" (Extrait des *Annales de l'Institut Colonial*), Marseille, 1897.

The above does not pretend to be a complete list, but most of the works dealing with the histology of the drug will, it is hoped, be found in it.

The following general text-books have also been freely consulted:—

Dr. A. de Bary, Comparative Anatomy of the Vegetative Organs of the Phanerogams and Ferns. Translated and annotated by F. O. Bower, M.A., F.L.S., and D. H. Scott, M.A., Ph.D., F.L.S., Oxford, 1884.

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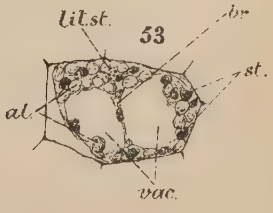


F. O. Bower, D.Sc., F.L.S., "A Course of Practical Instruction in Botany," London, 1891.

Ph. Van Tieghem, "Traité de Botanique," Paris, 1891.

Dr. A. Tschirch, "Angewandte Pflanzenanatomie," Wien und Leipzig, 1889.

Dr. A. Zimmerman, "Botanical Microtechnique." Translated from the German by James Ellis Humphrey, S.D., Westminster, 1896.

Explanation of Figures.[1]

Fig. 1. (*Plate I.*) Seeds from the same pod. A_1 to E_1, ventral surfaces; A_2 to E_2, dorsal surfaces; A_3 to E_3, side views; *f.sc.*, scar of funicle. Natural size.

Fig. 2. (*Plate I.*) Longitudinal section at right angles to the plane of the two cotyledons; *s.c.*, seed-coats; *wg.*, wing; *ra.*, raphe; *alb.*, albumen; *cot.*, cotyledons; *g.p.*, growing point of stem; *rad.*, radicle; *st.+*, region of albumen containing abundance of starch; *st.—*, region of albumen containing little starch. × 3 diameters.

Fig. 3. (*Plate I.*) *a*, seed-coats (in an inverted position); *b*, albumen; *c*, embryo, separated out by soaking; *r.s.*, extremity of albumen in which the radicle was situated; *cot.* cotyledons; *rad.*, radicle. Natural size.

Fig. 4. (*Plate I.*) Transverse sections through upper, middle, and lower portions respectively, of a well-developed seed, Lettering as in Fig. 2. × 3 diameters.

Fig. 5. (*Plate I.*) *a*, *b*, *c*, *d*, *e*. Transverse sections through seeds from the same pod. × 3 diameters.

Fig. 6. (*Plate I.*) Transverse section, approximately through the middle of a seed, mounted in pure glycerin. *ep.*, epidermis of seed-coats; *gr.l.*, compressed pigmented sub-epidermal layers of seed-coats (shewn as a black line); *f.*, folds of seed-coats; *ra.*, vessels of raphe; *proc.*, central series of procambial strands (bundle rudiments); *latl. b.*, rudiments of lateral bundles; *mu.*, mucilage. Other lettering as in Figs. 2 and 4. Epidermal hairs entirely omitted. Diagrammatic. × 20 diameters.

Fig. 7. (*Plate I.*) Transverse section through seed-coats and albumen, from left-hand top-corner of Fig. 6, after treatment with chloral-hydrate solution. Lettering as in Fig. 6. Diagrammatic. × 20 diameters.

[1] The plates illustrating this paper were kindly supplied by Messrs. Burroughs, Wellcome & Co.

FIG. 8. (*Plate II.*) Transverse section through the middle of a seed, on the side opposite to the raphe, showing seed-coats, albumen, and the outer part of one cotyledon. For explanation of numbers see text. × 200 diameters.

FIG. 8a. (*Plate III.*) The numbered portions of Fig. 8, seen in surface view, or in tangential section. × 200 diameters.

FIG. 9. (*Plate II.*) Transverse section through raphe and seed-coats on the ventral surface of a seed. *par.*, outer sub-epidermal tissue of seed-coats, consisting of loose parenchyma; *sm.c.par.*, small-celled parenchyma encircling the vessels of the raphe; *v.b.*, vessels of the raphe; *gr.b.*, pigmented layers of seed-coats; *h-cush.*, cushions formed by the hairs in the furrows. Other lettering as in Fig. 8. × 200 diameters.

FIG. 10. (*Plate III.*) Surface view of the epidermis of the seed-coats soaked out in water. Somewhat diagrammatic. × 20 diameters.

FIGS. 10′, 11, and 13. (*Plate III.*) Optical longitudinal sections of epidermal cells of the seed-coats. *h.*, hair; *l.hp.*, lignified hoop on the lateral walls; *hp.s.*, hoop section; *r.*, lignified ring; *l.h.b.*, lignified portion of hair. × 200 diameters.

FIG. 12. (*Plate IV.*) An epidermal cell with its attached hair, seen in perspective. Lettering as before. × 200 diameters.

FIGS. 14 to 16. (*Plate IV.*) Surface views of same. Hairs broken off. *Cell.w.*, outer cellulose portion of lateral walls. Other lettering as before. The cross in Fig. 16 indicates the places where some of the ascending bands have been broken off. × 200 diameters.

FIG. 17. (*Plate IV.*) Perspective surface view of same. Lettering as before. × 200 diameters.

FIGS. 18 and 19. (*Plate IV.*) Hairs of same. *br.*, branches joining lignified ring to lignified portion of hair. Other lettering as before. × 200 diameters.

FIG 20. (*Plate IV.*) Optical longitudinal section of an epidermal cell, with portion of its attached hair. *r.t.*, "rafter-like" thickening. Other lettering as before. × 200 diameters.

FIG 21. (*Plate IV.*) Optical tangential section of same. Lettering as before. The cross indicates the places where ascending bands have been cut through. × 200 diameters.

FIG. 22. (*Plate V.*) Transverse section through portions of three epidermal cells. *Cell.mem.*, cellulose membrane; *m.l.*, middle lamella. Other lettering as before. × 400 diameters.

FIGS. 23 to 26. (*Plate V.*) Transverse sections through portions of the epidermis of the seed-coats. Lettering as before. × 200 diameters.

FIG. 27. (*Plate V.*) Optical transverse section of same. For explanation, see text. × 400 diameters.

FIGS. 28 to 30. (*Plate V.*) Tangential sections of same. × 200 diameters.

FIG. 31. (*Plate V.*) Radial longitudinal section through cells from layer 3 in Fig. 8. × 200 diameters.

FIG. 32. (*Plate V.*) Tangential section through same. × 200 diameters.

FIG. 33. (*Plate V.*) Transverse section through the albumen at the lateral edges of a seed. Numbering as in Fig. 8. × 200 diameters.

FIG. 34. (*Plate VI.*) Surface view of the external face of the albumen in the region of the root-cap. *wr.*, gutter-like wrinkle. × 200 diameters.

FIGS. 35 to 37. (*Plates V. & VI.*) Cells of albumen, cleared with chloral-hydrate and stained with hæmatoxylin. *ps.-t.*, fold of cell-wall; *br.*, protoplasmic bridles; *vac.*, vacuoles; *n.*, nuclei; *sp.*, spaces due to removal of cell-contents. × 300 diameters.

FIG. 38. (*Plate VI.*) Cells from the perisperm (albumen). After Dr. Nevinny.

FIGS. 39 to 41. (*Plate VI.*) Cells of the endosperm (albumen), from three different commercial varieties of Kombé seed. After Dr. Blondel.

FIG. 42. (*Plate VI.*) Endosperm (albumen) of a starch-bearing variety. The section is defatted, and the aleurone grains have been removed with water. After Professor Hartwich.

FIG. 43. (*Plate VI.*) Cells from the albumen. Taken from Fig. 6, Plate VI. of Professor Fraser's monograph. × 150.

FIG. 44. (*Plate VI.*) Cells from the albumen, mounted in pure glycerin. *gel.g.m.*, gelatinous protoplasmic ground mass; *vac.*, vacuole. × 300 diameters.

FIG. 45. (*Plate VI.*) Cell from the albumen, treated with aqueous potash. × 300 diameters.

FIG. 46. Longitudinal, somewhat oblique section through radicle and surrounding albumen. Lettering as before. Diagrammatic. × 30 diameters. (*Plate VI.*)

FIG. 47. Surface of albumen, from over the root-cap. Diagrammatic. × 40 diameters. (*Plate VI.*)

FIG. 48. Longitudinal section, through radicle and through base of cotyledons, at right angles to the plane of the latter. *r.c.*, root-cap; *lat.wb.*, felt of laticiferous tissue. Other lettering as before. Diagrammatic × 30 diameters. (*Plate VI.*)

FIG. 49. Transverse section through the midrib of a cotyledon, *out.ep.*, outer epidermis of cotyledon; *par.*, general parenchyma of midrib; *lat.t.*, laticiferous tubes; *proc.*, procambial stands; *in.ep.*, inner epidermis of cotyledon. × 200 diameters. (*Plate VII.*)

FIG. 50. Longitudinal section of outer half of same, at right angles to the plane of the cotyledon. Lettering as in Fig. 49. The cross indicates the point where the branching of a tube occurs. × 200 diameters. (*Plate VIII.*)

FIG. 51. Laticiferous tube in transverse section. Mounted in chloral-hydrate. × 400 diameters. (*Plate VII.*)

FIG. 52. The same, mounted in glycerin. × 400 diameters. (*Plate VII.*)

FIG. 53. Cell of albumen, from which the oil has been removed, stained with iodine water. *st.*, starch grains; *lit.st.*, small starch grains; *al.*, aleurone grains (?). Other lettering as before. × 300 diameters. (*Plate VII.*)

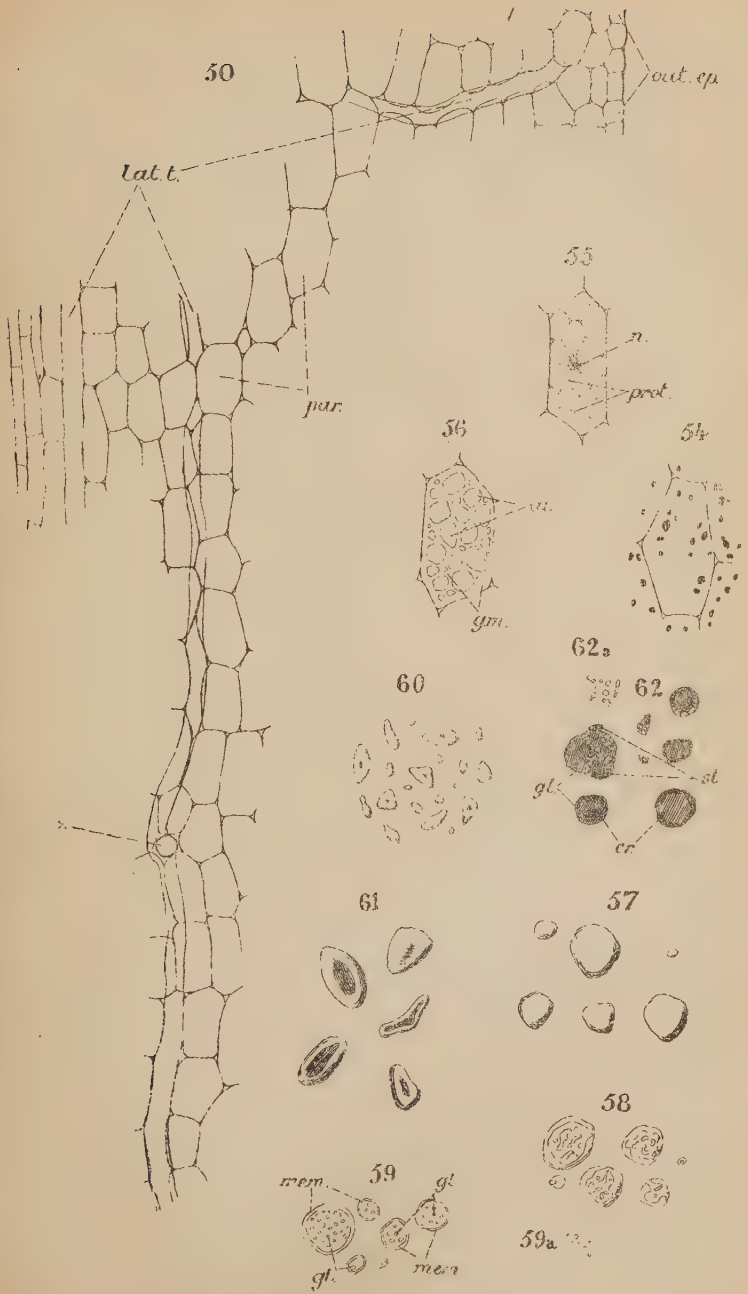
FIG. 54. Cell from the general parenchyma of the midrib of a cotyledon, treated with chloral-hydrate-iodine solution. × 300 diameters. (*Plate VIII.*)

FIG. 55. Cell from the general parenchyma of a cotyledon, cleared with chloral-hydrate solution and stained with hæmatoxylin. *n.*, nucleus; *prot.*, network of protoplasmic remains. × 300 diameters. (*Plate VIII.*)

FIG. 56. The same, mounted in pure glycerin. *al.*, aleurone grains; *g.m.*, the oily protoplasmic ground mass. × 300 diameters. (*Plate VIII.*)

FIG. 57. Aleurone grains from cotyledons, mounted in pure glycerin. × 500 diameters. (*Plate VIII.*)

FIG. 58. The same in iodine water. × 500 diameters. (*Plate VIII.*)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out. ep.
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62
st.
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cr.
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58
59
mem.
gl.
gl.
mem.
59a

FIG. 59. The same with extremely dilute potash. *mem.*, mem-
(*Plate VIII.*) brane; *gl.*, globoids. × 500 diameters.
FIG. 59a. Globoids of same. × 500 diameters.
(*Plate VIII.*)
FIG. 60. Starch grains from albumen, in iodine water. × 500
(*Plate VIII.*) diameters.
FIG. 61. The same, treated with chloral-hydrate-iodine solution.
(*Plate VIII.*) × 500 diameters.
FIG. 62. Aleurone grains (?), from albumen, in iodine water. *St.*,
(*Plate VIII.*) adhering starch grains; *gl.*, globoids (?); *cr.*,
crystalloids (?).
FIG. 62a. Globoids (?) of same.
(*Plate VIII.*)

THE WELLCOME RESEARCH LABORATORIES.

The PRESIDENT said this paper represented a vast deal of work, and would be a credit to any German professor, but it was all done by a student from the School of Pharmacy, trained under Professor Greenish, who, he was quite sure, would be proud of his pupil.

Professor GREENISH said there was no doubt this paper did reflect great credit on the author, although it was not one which lent itself readily to discussion. He had followed the work with a great deal of interest during the months it had been going on, because some years ago he took up these same seeds and submitted them to a histological examination, when he found that in certain particulars they did not answer to the published description, and there were certain things which he could not quite clear up before he had to put the matter aside. Now Mr. Perrédès had taken it up, and after a great deal of time and labour had produced a monograph on the structure of Strophanthus seeds such as had not hitherto appeared in any language. He felt proud that this had been done by a student of that school, though for lack of time Mr. Perrédès had not been able to do himself anything like justice. This paper showed the value of accurate and minute observation, for a number of inaccurate statements which had been made about these seeds were evidently due either to careless observation or to not examining a sufficient number of specimens.

Dr. SYMES asked if the author intended to pursue the investigation to other species of Strophanthus. He had shewn that there were seeds with varying characteristics, and giving different re-

actions, sometimes in the same pod, and it would be very useful to have a detailed account of other varieties.

Mr. RUTHERFORD HILL said he had had an opportunity of seeing some of the work done by Mr. Macfarlane for Dr. T. R. Fraser on the original samples of Strophanthus, and could confirm the statement that this research went further, and the observations were much more minute and accurate than anything Mr. Macfarlane had even pretended to do. He had recently observed a large number of ordinary commercial varieties of Strophanthus seed, which in the Botanical Gardens in Edinburgh failed to grow at all, although they were placed in favourable conditions, and he judged from this that the vitality of the seed was very limited. This might have an effect on its medicinal value, and it was quite clear that commercial tinctures of Strophanthus varied very much in therapeutic power. He knew that some practitioners never prescribed less than three times what Dr. Fraser considered the maximum dose, and recently he met with a case in which between one and two drachms were swallowed without any ill effect.

Mr. HAROLD WILSON said he was quite sure that any work done by Mr. Perrédès, who was known as a most careful student, could be implicitly relied on. Although Mr. Perrédès regarded it as a misfortune that he had not been able to point out any characteristics by which the official Strophanthus seeds could be distinguished from others in the market, he must not be cast down on that account; the object of all research was to discover the truth, and if it did not yield the results anticipated it was not the fault of the investigator. It was better to be aware of their ignorance than to fancy they knew more than they really did.

Mr. NAYLOR hoped nothing more would be heard of the sulphuric acid test, as it was quite obvious that inferences drawn from it were not accurate.

Mr. PERRÉDÈS, in reply, said his intention at the outset was to see if it was possible to distinguish between these various seeds, but found that not only was there no difference practically so far as he could see from a cursory examination, but that there were other things present which had not been described. It was essential in the first place to find out what was there before getting at the characters of other seeds. He hoped further investigations might be made, but that did not altogether lie with him. There was the further difficulty that they did not really know what seed they were dealing with; they knew that this seed which he had examined was one which answered to the description in the B.P.

pretty closely, but its botanical origin was in such a chaotic condition that it would be well to wait until they could get authentic seeds from a well-established origin. He feared that Mr. Holmes would have to go to East Africa himself in order to make sure of that. With regard to the sulphuric acid reaction, he should not like to say much. He could only repeat what he had already said in his paper.

A hearty vote of thanks was accorded to Mr. Perrédès for his paper.

The Conference adjourned for the day.

Wednesday, July 25th.

The PRESIDENT took the chair at 10 a.m.

Mr. GLYN-JONES asked if there was any likelihood of the whole of the papers being read and discussed. He put the question because he saw, almost at the end of the list, a paper on the B.P. as a standard for articles of commerce, which seemed to be similar in character to one read last year, which there was no time to discuss. He ventured to suggest that the Conference might divide into two sections, and so get through the whole of the business.

The PRESIDENT said it would be obviously impossible to read and discuss fully the whole of the papers, and he should be quite willing, if the meeting agreed, to divide the papers, selecting those of a more especially chemical character to be taken in another room.

Dr. ATTFIELD said he was interested in all the papers, and probably many others were in a similar position.

Mr. RUTHERFORD HILL thought the best plan would be to go straight ahead with the papers as far as they could.

After a few other remarks, the motion for dividing the Conference was put to the vote and negatived by a decided majority.

The following paper was then read :—

NOTES ON SOME INDIAN DRUGS.

By William Mair, F.C.S., Edinburgh.

In response to an invitation, from the distinguished President of this Conference, to indicate which of the more important unofficial drugs indigenous to British India, and in actual use by native and European physicians, would be likely to present features of practical interest and utility to pharmacists in this country, and to pharmacists generally, the following brief details are submitted. I should add that my experience is limited to Calcutta, which may be taken to be fairly representative of the Bengal Presidency, and the drugs I propose to deal with are well known throughout India. The promised early publication, by the General Medical Council, of an Indian and Colonial Addendum to the British Pharmacopœia of 1898 (expected to be authorised for issue by the end of the present year), and the consequent completion of Professor Attfield's worthy ideal of the expansion of that volume into an Imperial British Pharmacopœia, suggests the desirability for some acquaintance with such of its probable contents as may be useful to pharmacists outside those portions of the empire for the special use of which products and preparations are to be officially recognised. Of the forty or fifty medicinal substances and practically corresponding number of pharmaceutical preparations, the greater part—about thirty—represents those requested by India and incorporated in Professor Attfield's Draft Addendum, now proceeding to a final draft through the hands of influential experts in India.

The question that has presented itself to some practical pharmacists is whether any or all of these are likely to come into use in medicine in this country and which are likely to be worthy of attention of those that have been proved to be good for specific purposes in the land of their origin. It is not unnatural to expect that the great British dependency which has given us nux-vomica, cannabis indica, santal wood, kino and chiretta, should still possess the secret of others of equal individuality. Whether that is so or not, whether there are lurking in the bazaars drugs of subtle action or potent virtue calling for a wider sphere of influence, it may not be for me to express an opinion. There are drugs in every-day use in the districts, as distinguished from the Presidency cities, the names of which are not even known to Europeans, but it is hardly possible that any of equal value to those I have indicated, or any

drug with therapeutics not already represented in the Pharmacopœia could have escaped the notice of observers and investigators.

To proceed to an analysis of the thirty medicinal products of India likely to be included in the forthcoming Addendum, as a selection bearing the stamp of official approval, there fall to be eliminated those that are intended for use in India only as local substitutes for, and alternatives of, the official imported products. It does not directly concern us how far calumba could be replaced by coscinium, its former arch adulterant; whether the wood of samadera would equal that of quassia, unless the latter were becoming scarce and dear; how far the root bark of toddalia may represent cusparia; or cissampelos would pareira; to what extent the leaves of *Datura alba* are equivalent to those of belladonna in terms of the relationship of daturine to atropine and hyoscyamine; whether also cotton root bark will make an infallible substitute for ergot; or whether the telini fly will not yield more cantharidin than the true cantharides; or the very doubtful tylophora leaves, or the root bark of calotropis (mudar), both advocated for many years but never used, supersede the indispensable ipecacuanha, which, unhappily, has not yet been successfully cultivated on a commercial scale in India. Few of these alternatives are likely to acquire much significance to pharmacists outside of India, or to importers. Butea gum may come to be recognised in this country as in some measure, though very imperfectly, representing the official kino. In which case the question presents itself whether the use of the Addendum may not be reciprocal, and whether these country medicines, to be recognised for use in India instead of the imported drugs, may not be officialised for use in this country in time of scarcity. There are others, however, of more strictly commercial importance which would be better considered from that point of view, but for which recognition is desirable for the adjustment of official standards. These are gummi indicum (dhaura gum), when clean and good quite equal to gum acacia; the oil of gingeli seed (sesamé oil), exported from India in oil and seed to the value of nearly a million sterling per annum, approximating to olive oil, and oleum arachidis (nut oil), proposed to be "employed in Indian pharmacy whenever olive oil is ordered in official preparations," to quote the words of the Draft Addendum. Wherein the question of reciprocity would again arise. It is fortunate that many important points of chemical, physiological, and therapeutical detail in reference to these articles will now be

finally settled by the committees entrusted with their pharmacological investigation, but it has to be said that some of the alternatives proposed—which have most probably, however, been subsequently reconsidered, are not known in actual use, and it is difficult to understand why, for instance, crinum bulbs should have been recommended for use instead of squill, while no mention has been made, so far, in any of the published reports, of the bulbs of either *Urginea indica*, or of *Ledebouria hyacinthoides*, the squill of the bazaars, largely and regularly used in Government dispensary practice.

I omit also from consideration at this time betel leaves and jasmine flowers, both used in the fresh state for purely domestic purposes.

The following draft may be found to be worthy of a more definite place in medicine in this country; some are old friends seeking re-introduction. They would repay attention and trial in the conditions indicated. I ought to state here that it was my intention to have accompanied this paper with formulæ and processes for the preparations of each drug I would consider most suitable. It has not been found possible, however, to complete the long series of experiments necessary to arrive at reliable data. The details of these processes will appear in full, however, in this paper as published in the *Year-Book*.

Andrographis paniculata, the kreat, the dried herb (shown).—Perhaps the most worthy of the many simple bitters of India to recognition in addition to chiretta, not as a substitute for it. One of its vernacular names implies "king of bitters." Contains a neutral, non-alkaloidal bitter principle, unnamed, and has febrifuge properties which chiretta does not possess. For that reason is appreciated in India, and frequently prescribed in convalescence after fevers; has been employed successfully in influenza. Fluid extract.

Belæ fructus.—Although tried in this country and found wanting, the sacred bael is, as it has always been, the most trusted of Indian indigenous medicines, constantly prescribed by European physicians, and of unquestionable value in diarrhœa, avoiding, especially in children, the constipation attending the use of astringents. An aqueous fluid extract from the pulp of the *fresh* half-ripe fruit, instead of that "imported in dried slices," will redeem its character. Another preparation in great favour in India is a confection of bael, sometimes aromatised, a valuable dietetic, in teaspoonful doses, in chronic diarrhœa, made from the

pulp of the fresh, just-*ripe* fruit, freed from the seeds by passing through a coarse sieve, and preserved with sugar. For the extract, the fruits, freshly imported, whole, would require to be used; the confection would be best prepared on the spot and imported after the manner of tamarinds and chutnies.

Ispaghula, seeds of *Plantago ovata* (shown).—These minute, boat-shaped seeds (shown) are imported from Persia. Contain no medicinal principle whatever, but are peculiarly successful as a remedy in diarrhœa and dysentery, and as an intestinal emollient in gastric catarrh. The simplicity of their action is such that no preparation can be suggested. One drachm of the cleaned seeds is infused for twenty minutes in five ounces of cold water, sweetened with sugar, and the resulting mucilaginous mass swallowed unstrained. The action is purely mechanical, the abundant, bland, adherent mucilage allaying the intestinal irritation. They are employed in the manner indicated by distinguished officers of the Indian Medical Service.

While this paper is in no sense a criticism of the published material proposed for the Addendum, the limit of time for the presentation of comments and suggestions, as invited by the editor (significant of a new era in Pharmacopœia making) having passed, I cannot refrain from expressing the hope that some of the following may have been deemed equally worthy of recognition with the foregoing.

Holarrhena antidysenterica, kurchi, root-bark (shown).—This perhaps, comes next to the bael in the estimation of European prescribers in India, among the country medicines. The active principle is the alkaloid kurcheine, and the properties are mildly astringent, anti-dysenteric, and febrifuge, the latter a most valuable association. Both a solid and a liquid extract are used, the latter the more desirable; a formula and process will be presented in the *Year-Book*.

Garcinia mangostana, mangosteen rind (shown), imported from Singapore.—Contains tannin, resin, and a yellow crystallisable principle, mangostin. Used popularly like kino or catechu, not much prescribed, in the form of a syrup made by boiling the rind in water and adding sugar to the strained decoction. A better process is to make the syrup from a fluid extract from 20 per cent. alcohol.

Carica papaya.—The importance of the papaya fruit (shown) cannot be over-estimated, and it may be found to have been given a place in the ultimate Addendum for the sake of the well-known

papaïn, as an alternative to pepsin, if only on the ground of cas prejudice. An elegant liquor papaïn, which is made from th fresh milky juice and preserved with glycerin, is also in vogue a a successful "vegetable pepsin."

Eugenia jambolana. Jambul seeds (shown).—If this drug ha not fulfilled all that was claimed for it, it remains to be prove that it is not of use in the treatment of diabetes. All that nee be said is that it is used by the people and prescribed by disti guished native physicians. The secret may perhaps lie in makir the aqueous liquid extract from *fresh* seeds from ripe fruit.

Garcinia odorata. Chaulmugra seeds (shown).—The value the expressed oil in eczema, psoriasis, and allied skin affections too well known to call for comment. It is regularly and large prescribed for external use, and in the style of a cream, with equ parts of the oil, lanolin, and lime water.

Adhatoda vasica. Leaves (shown).—Used in pulmonary affe tions, and regarded as an internal antiseptic in phthisis. Contai a white crystalline alkaloid—vasicine—sparingly soluble in wate soluble in alcohol. The drug is strongly alkaline, due to th presence of potassium chloride. The only preparation I have see prescribed is syrup vasak; does best made from a liquid extract.

I have the honour to acknowledge my indebtedness to Profess Wyndham R. Dunstan, F.R.S., for authentic specimens from th Imperial Institute collection, to Mr. E. M. Holmes, F.L.S., f other specimens, and to my friend Mr. Fred. Bascombe, F.I.C., f undertaking and carrying through the pharmaceutical work i volved, in the laboratories of Messrs. Fletcher, Fletcher & C Limited, to whom also my thanks are due.

The PRESIDENT said this paper was the answer to a question put to the author some time ago, as to what Indian drugs we really used by native physicians. He should like to know ho far the *Andrographis paniculata* was used as a substitute f chiretta in places where the latter was not available. Wi regard to the *Belæ fructus*, he believed there was some misu derstanding. He understood that for diarrhœa the unripe fru was used, and for a laxative the ripe fruit, the properties bein of course, quite different. With regard to Ispaghula seeds could give an instance of its usefulness. Some three years ago professor of botany in one of the London hospitals told him h housekeeper had been suffering for six months from chron

diarrhœa, which resisted all the remedies which had been tried. He advised him to give a teaspoonful of these seeds, and shortly afterwards heard that the remedy had been entirely successful. When these seeds were put in water they exuded a quantity of mucilage. In passing through the alimentary canal an ounce of gum arabic solution would easily be diluted, but these seeds would attach themselves here and there, and would exude on the surface a sufficient quantity of mucilage to act as a protective agent. Whether or not there was any active principle in these seeds he was not sure. The *Plantago major*, another species of the same genus, had a powerful medicinal effect, and it would be interesting to know whether the effects noticed were in any degree due to an active principle. Mr. Hooper had written about *Adhatoda vasica* in the *Journal*, pointing out that it had a curious effect in destroying germs or insects. It evidently possessed powerful properties, and was worth investigating.

Dr. ATTFIELD said this paper abundantly justified the policy he had always supported of issuing such a document as that of the Addendum for consideration, criticism, and suggestions as long as possible before it was contemplated to make it an official book. They had had from Mr. Mair some most useful remarks upon those articles that had already been proposed for use in the Addendum, and they had got from him, who knew so much about the native drugs, suggestions about those drugs used in India which had not yet been brought before the Pharmacopœia Committee of the Medical Council. With regard to the position of the so-called Draft Addendum, while that was a convenient expression, really all that they had issued up to the present time was a *Report* on the Indian and Colonial Addendum of the British Pharmacopœia of 1898. It was not yet even a draft, but it was open to suggestions, and any remarks that any one interested in the pharmacy of India or of the Colonies had to make. It was somewhat in the nature of a draft, no doubt, but it was also what might be termed a *ballon d'essai*, thrown out to ascertain what the general feeling was throughout the Colonies, India, and this country. With regard to the particular question which Mr. Mair had so judiciously raised as to whether any of the substances that were already mentioned in the so-called draft, or which would be mentioned, and would, he trusted, be placed before pharmacists as a draft, would be of interest to pharmacists in this country, he (Dr. Attfield) was glad that the question had been raised, but it was one that must be left to settle itself after the Addendum was published.

With regard to the question whether there was any really important drug to be met with in the interior provinces of India which was not yet known to pharmacists in this country, Mr. Mair thought it was not likely, and after writing scores of letters and receiving scores of answers on this particular subject, he must say he agreed with Mr. Mair. He might be allowed to extend this remark to every one of the Colonies as well as to India. What with commerce and the energies of men like their President, the whole of Her Majesty's dependencies seemed to have been thoroughly examined with the view of ascertaining whether there was any generally important drug that was unknown to them, and so far there did not seem to be any. Mr. Mair said that the Addendum, so far as its character had hitherto been indicated, was not of very much interest to those in this country. Of course that was so, but he hoped it would be understood that from 1886, when it was suggested that something of this kind should be done, the idea had been to produce a list of drugs which would be useful in the Colonies and India, but not to be officially recognised for use in this country. Whether it would turn out that some might be used was another matter. Of the special articles mentioned by Mr. Mair, roughly speaking, one-half had already been suggested for use in India, and he was perfectly sure that the Medical Council would be thankful to the reader of the paper for the remarks he had made respecting the other substances which might possibly be included in the Addendum, and he was personally thankful to him for bringing them forward now. Although the time mentioned in the so-called Draft Addendum was passed, that time was only mentioned in order that they might as soon as possible get in suggestions from the whole of Her Majesty's dependencies, but the time had not passed when the Medical Council would gladly receive suggestions of any kind whatever in relation to the draft Addendum.

Mr. Bascombe thanked Mr. Mair for kindly mentioning his name, and was sorry that circumstances had prevented his supplementing the paper by one of his own; but he might mention that he had still some experiments on hand for a paper on the purely pharmaceutical side of the subject.

A vote of thanks was accorded to Mr. Mair.

The next paper was read by Mr. Moor on :—

THE ASH OF B.P. DRUGS.

By C. G. Moor, M.A., F.I.C., and Martin Priest, A.I.C., F.C.S.

The British Pharmacopœia gives limits for ash in the case of several drugs, with the object in most cases of securing the absence of an undue proportion of extraneous mineral matter, or in other cases with the object of securing the absence in the powdered drug of other portions of the plant that are unofficial.

We have for a considerable time been engaged in the examination of the tinctures of the British Pharmacopœia, and the differences observed in some of them led us to believe that useful information could be obtained by estimating the ash and alcohol solubility of the drugs used in their preparation. As the estimation of ash in B.P. drugs was also one of the problems set in the "Blue List" for the Conference, we venture to submit the figures we have obtained ourselves, together with published ones which we have collected.

We do not pretend that in any single case the information we are able to present is in any way exhaustive; at best it can only serve as a skeleton to be clothed in the future.

It will, however, we think, be new to many that considerable quantities of mineral matter are to be found in certain drugs, and in one or two cases our figures go to show that there should be some modification in the B.P. limits of ash—as, for instance, in cardamoms and colocynth pulp.

As regards the origin of the samples we have worked on, a considerable number were given to us by Mr. E. M. Holmes, and others were given to us by friends, or examined in the course of ordinary work.

Where we had any reason to feel doubt as to the authenticity of any drug, we have had the advantage of Mr. Holmes' opinion.

We shall be particularly glad to receive figures on the ash of any drugs in order to correct or amplify this paper, and have no doubt that many analysts have figures which, when collected, would settle some of the doubtful points that will be noticed.

We believe that it will generally be agreed that, when a new Pharmacopœia is issued, the ash-limits can be considerably extended, and as we have some criticism to offer on those at present

laid down, the greater the number of observations that can be collected the better it will be.

Acaciæ Gummi :—

Sudan Gum (picked)	3·0 to 3·16,	Priv. Com.
Turkey „	3·2 to 3·4,	„ „
Mogadore Gum	3·7 to 4·0,	„ „
Senegal „	3·1,	Caines
„ „	2·6,	M. and P.
„ „	2·8,	Priest
Turkey Medium, bold	3·85,	„
Small Turkey, browned	2·5,	„

(*B.P. limit*, 4·0.)

Aconiti Radix :—

4·7, Moor
3·5, Priest
3·8, M. and P.
8·6, Priest
5·0, „

It appears that the ash of properly washed roots should not exceed 5–6 per cent.

Adeps Lanæ :—

0·09, Moor
(*B.P. limit*, 0·3.)

Aloe Barbadensis :—

1·7 to 2·2, Umney
2·6, M. and P.
2·7, M. and P.
1·6, M. and P

Aloe Socotrina :—

1·7 to 2·2, Umney
1·7 to 2·3, Cribb
4·1, M. and P
2·6, Priest

Ammoniacum :—

Tears	1·2,	Umney
	2·3,	Moor
	2·0,	Priest
Quality (1)	1·6,	M. and P
„ (1)	2·1,	„
„ (2)	5·6,	„
„ (3)	15·4,	„
	2·3,	„
	1·5,	„

Dieterich suggests 10 per cent. as a limit, but this appears an unnecessarily large allowance.

Anethi Fructus :—

7·7, Cribb
6·6, Umney
6·2, Moor
7·5 Priest

Anisi Fructus :—

Spanish, 8·1, Umney
Russian, 6·9, „
4·9, Moor
7·5, Cribb
3·6, M. and P.
Calcutta, 11·36, Priest
11 to 43, Hockauf
Pulv., 11·4, Priest

Anthemidis Flores :—

5·6, Umney
5·1, Cribb
4·3, Priest

Araroba :—

9·8, Moor
5·3, Priest
5 to 80, Pearmain

The ash is very variable, but as the drug is judged by its yield of chrysarobin the ash figure is not very important.

Arnicæ Rhizoma :—

These samples were specially cleaned by beating.
9·2, Umney
6·2, Moor
9·4, „
8·9, Priest
33·7, M. and P.
31·7, Moor
15·5, Priest
12·5, „
12·1, „
18·3, „
25·35, Priv. Com.

These high ashes are due to earth mechanically enclosed.

Asafetida.—The ash in tears may be as low as 2 per cent., the average being about 5, asafetida in mass varies greatly, some samples containing 60 per cent. For the present we suggest an ash limit of 20 per cent.

(*B.P. limit*, 10.)

If the volatile portion of the drug is the most active it would be better to make the tincture from the mass rather than from tears, which are lower in oil. The tincture at present is very variable in total solids, and we suggest as a provisional standard 10 per cent. of solid residue.

Aurantii Cortex Siccatus:—

6·3, Moor
6·5, „
5·6, Priest
6·2, „

Balsamum Peruvianum:—

0·2, Moor

Balsamum Tolutanum:—

0·65, Moor

Belladonnæ Radix:—

6·4, Moor
8·1, „
9·2, „
7·2, „
6·5, Theo. Brewis
7·3, Priest
6·1, „
0·3 to 13·7, Hockauf, *B. and C. D.*, xxxiii. 597.

These roots, like aconite, should be carefully washed and dried.

Benzoinum:—

Sumatra 3 qualities	0·5,	Moor
	0·8,	„
	1·0,	„
Sumatra	0·9,	M. and P.
Siam	2·5,	„
	0·28,	„
	0·82,	„

The ash figure in benzoin is not of much value, but the alcohol solubility is of great importance, and some clearer definition than "almost entirely soluble" should be laid down. Possibly a benzoic acid standard might be given.

Buchu Folia:—

4·8, Moor
4·4, Priest

Calumbæ Radix :—

4·3, Umney
5·1, Moor
5·7, „
7·4, M. and P.
7·8, „
Powdered, 11·8, Priest
„ 10·3, „
5·5 to 8·5, Hockauf, *B. and C. D.*, xxxiii. 597.

Cambogia :—

0·84, Moor
0·35, Umney
0·75, Priest
3 to 4, Woolsey, *A. J. P.*, lxx. 446.
(*B.P. limit*, 3·0.)

Cannabis Indica :—

17·0, Umney
13·8, Priest

Cantharis :—

5·7, Umney
7·4, Priest
10·0, Moor
6·0, Priest

An ash limit of 7 per cent. might perhaps be suggested.

Capsici Fructus :—

4 to 7·5, Moor
4·6, Priest
6·8, M. and P.
Capsicum Annuum, 6·6, Priest
(*B.P. limit*, 6·0.)

Genuine capsicums appear sometimes to give an ash over 6 per cent.

Cardamomi Semina :—

	Seeds.		Husks.		Whole Fruit.	
	4·5	...	10·4	...	—	Moor
	5·7	...	8·8	...	8·2	„
	3·7	...	8·8	...	5·4	„
	5·1	...	10·5	...	7·7	„
	5·1	...	—	...	—	M. and P.
	3·7	...	—	...	—	„
Mysore	3·3	...	7·1	...	—	Priest
Wild Malabar deficient in seeds	6·1	...	10·9	...	—	„
Ceylon Short Bean	5·1	...	13·5	...	—	„
Finest Ceylon	4·16	...	—	...	6·16	„
Mysore, long, bleached	4·27	...	—	...	—	

(*B.P. limit*, 4·0.)

It appears that the B.P. limit of 4 per cent., which is given to exclude the pericarps, is a little too low. The presence of powdered pericarps in pulvi cardamomi sem. can be detected in other ways :—(1) By the ether extract. (2) By a fibre estimation. (3) By an estimation of the soluble ash.

Carui Fructus :—

5·5, Moor
7·5, M. and P.
(*B.P. limit*, 8·0.)

Caryophyllum :—

6·9, (Average of 78) A. Rau
4·8, Squire (Companion)
4·8, „ „
5·1, „ „
5·4, Moor
6·1, Priest
5·2, M. and P.
6·1, „
6·0, „
5·9, „
5·2, „
5·2, „
(*B.P. limit*, 7·0.)

Cascara Sagrada :—

4·6, Priest
3·9, „
7·0, Moor
5·2, Priest

Cascarilla :—

8·8, Moor
7·5, Priest
Powdered 10·7, „

Cassiæ Pulpa :—

11·3, Umney
5·1, M. and P.

Catechu :—

3·6, Moor
4·0, M. and P.
4·4, Priest
5·9, Hockauf, *B. and C. D.*, xxxiii. 597.
(*B.P. limit*, 5·0.)

Chirata :—

6·3, Umney
3·5, Priest
3·0, Moor

Chrysarobinum :—

0·25, M. and P.
(*B.P. limit*, 1·0.)

Cimicifugæ Rhizoma :—

7·1, Priest
5·7, „
7·0, „
11·3, Umney
5·6, M. and P.

Cinchonæ Rubræ Cortex :—

2 to 3, Squire (Companion)
2 to 3·5, Lucas
4·0, Moor
1·8 to 6·0 Hockauf, *B. and C. D.* xxxiii.

Cinnamoni Cortex :—

4·3, Squire (Companion)
4·0, „ „
3·4, „ „
4·6, „ „
4·8, „ „
5·1, „ „
4·4, „ „
Average of 142 5·54, Rau
4·0, Dyer and Gilbard
4·8, „ „
3·0, „ „
4·4, „ „
5·0, „ „
3·5 to 4·1, Lucas
4·1, Moor
4·8, „
4·6, „
5·9, Priest
5·5, „
4·7, „
Pulvis, 8·2, „

An ash limit of 6 per cent. might be suggested.

Cocæ Folia :—

6·3, M. and P.
8·0, Moor
7·2, Priest
6·8, „
5·0 to 11·5, Hockauf, *B. and C. D.*, xxxiii. 597.

Coccus :—

3 samples	over 40,	Merson
2 „	„ 30,	„
5 „	„ 20,	„
3 „	„ 10,	„
6 „	„ 4,	„
8 „	under 4,	„
	30·8,	Moor
	8·2,	„
	5·2,	M. and P.
	31·7,	„
	7·8,	Priest

(*B.P. limit*, 6·0.)

This limit might be reduced with advantage, and dressing with French chalk, etc., prohibited.

Colchici Cormus :—

2·4,	Moor
2·2,	Priest
2·2,	„

Colchici Semina :—

5·1,	Moor
2·6,	Priest

Colocynthidis Pulpa :—

6·7,	Priest
7·3,	„
7·2,	Moor
8·6,	„
10·1,	Priest

(*B.P. limit, not less than* 9·0 *per cent.*)

The figures on colocynth pulp were obtained on pulp separated by ourselves, the seeds being all carefully removed. It seems that the B.P. requirement is rather too high.

It is a matter of great difficulty to obtain an ash free from carbon, and perhaps it would be better to specify that the ash should be sulphated.

Conii Fructus :—

19·0,	Moor
14·6,	Priest

Coriandri Fructus :—

	5·8,	Moor
3 samples Fruit,	4·7 to 5·7,	Squire (Companion)
„ Pulvis,	5·6 to 7·8,	„ „

Crocus :—

4·8, Moor
5·0, „
4·9, „
4·7, Priest
Alicante, 25·5, „
(*B.P. limit*, 7·0.)

Saffron has been adulterated for centuries, both with mineral and vegetable matters. The B.P. test should be supplemented by the following :—

"Every fragment should, on contact with strong sulphuric acid, afford a deep, transient, blue colour."

Dyed fragments examined by us have given a pink instead of the blue colour given by true saffron.

Cubebæ Fructus :—

7·3, Moor
5·3, Priest
Stalks, 9·7, „
Pulvis, 8·9, „

Cuspariæ Cortex :—

6·7, Moor
6·2, Priest

Cusso :—

4·75, Priest

Digitalis Folia :—

8·1, Moor
Pulvis, 10·6, Priest
7 to 10, Hockauf

Elaterium :—

7·9, Priest

Ergota :—

3·5, Moor
3·7, „
3·5, „
5·7, Priest

Eucalypti Gummi :—

0·62, Moor

Euonymi Cortex :—

9·6, M. and P.

Filix Mas :—

4·9, Priest
6·2, „
10·9, „
1·4 to 3·0 Hockauf, *B. and C. D.*, xxxiii. 597.

Fœniculi Fructus :—

12·1, Moor
8·7, „
Fruits, 7·7 to 9·7, Squire (Companion)
Pulvis, 8·9 „ 12·8, „ „
Fruit, 8·9 Hockauf, *C. and D. Diary*, 1899, 266.
Powder, 8·8 to 15·6 „ „ „
Pulvis, 9·1 Priest

A limit of 12 per cent. might be suggested.

Galbanum :—

6·6, Moor
7·2, Priest

Galla :—

2·3, Moor
1·3, Priest

Gelsemii Radix :—

2·1, Moor
2·1, Priest
2·3, „

Gentianæ Radix :—

3·3, Moor
4·0, Priest
2·9, M. and P.
Pulv., 2·2, Priest

Glycyrrhizæ Radix :—

3·6, M. and P.
Pulv., 3·3, Priest

Granati Cortex :—

15·5, Moor
4·3, Priest
13·1, „

Guaiaci Lignum :—

1·3, M. and P.

Guaiaci Resina :—

1·4, M. and P.
1st quality 1·3, „
2nd „ 3·7, „
3rd „ 5·6, „

Hæmatoxyli Lignum :—

2·1, M. and P.
1·8, Moor
2·7, Priest

Hamamelidis Cortex :—

4·7, Moor
5·0, „
5·1, Priest

Hamamelidis Folia :—

8·5, Moor
5·1, Priest
4·6, M. and P.

Hemidesmi Radix :—

4·4, Moor

Hydrastis Rhizoma :—

12·0, Moor
8·6, Priest
4·7, „

Hyoscyami Folia :—

11·8, Moor
8·6, Priest

Ipecacuanhæ Radix :—

3·2, Moor
2·9, Priest
2·1, „
2·5, „
3·1, „
2·0 to 5·3, Hockauf, *B. and C. D.*, xxxiii. 597.

A limit of 5 per cent. might be suggested.

Jaborandi Folia :—

6·0, Moor
8·1, „
Pulvis, 11·7, Priest

Jalapa :—

4·0, Moor
6·6, Priest
6·2, „
5·4, „
4·8, „
4·2, „
Ipomœa simulans, 5·6, „

Kino :—

1·4, Moor
0·7 to 1·3 Will and Branch, *C. and D.*, liii. 57.

Krameriæ Radix :—

1·6, M. and P.
1·7 to 7·0, Hockauf, *B. and C. D.*, xxxiii. 597.

Limonis Cortex :—

4·9, Moor
5·3, Priest

Linum :—

Foreign, 3·6, Moor
English, 3·3, „
3·6, M. and P.
(*B.P. limit*, 5·0.)

Lobelia :—

9·0, Moor
12·6, Dott, *C. and D.*, lii. 463.

Lupulinum (Squire examined eight samples, seven gave over 20 per cent. ash) :—

15·6, Moor
(*B.P. limit*, 12.)

Lupulus :—

10·8, Moor

Mezerei Cortex :—

3·1, Priest
3·0, Moor

Moschus :—

5·2, Priest
(*B.P. limit*, 8·0.)

Myristica :—

Squire ('Comp.') "Nutmegs yield about 5% of ash." 2·4, M. and P.
2·1, „

Myrrha :—

Quality No. 1 3·8, Moor
„ „ 3·6, „
„ No. 2 9·9, „
„ „ 4·2, „
„ No. 3 17·0, „
„ „ 3·2, „
"Sorted" 9·8, M. and P.
"Parv." 9·8, „
"Best" 3·8, „
"Selected" 9·9, „
Not marked 9·0, 3·9, 4·6. Moor
4·8, 4·3, Priest

As in the case of benzoin, a minimum limit of alcohol solubility should be fixed, and in the case of myrrh an ash limit might be advisable as well. Dieterich suggests a limit of 10.

Nux Vomica :—

	2·0,	Moor
	1·3,	Priest
	1·1,	„

Papaveris Capsulæ :—

	9·1,	Moor

Pareiræ Radix (Brava) :—

	3·4,	Priest
	3·6,	„
	3·5,	„
Stem	8·5,	„
	5·4,	„
	2·7,	„
Bahia	1·9,	„
	1·5,	„
Variety uncertain	1·3,	Moor
	3·5,	„
	6·2,	Caines
	3·7,	M. and P.
	5·3,	„
	3·6,	„

Physostigmatis Semina :—

	3·9,	M. and P.

Pimenta :—

	4·2,	M. and P.

Piper Album :—

	1·0 to 3·0,	M. and P.
	4·0,	A. Rau (average of large number)

(This is in our opinion too high.)

Piper Nigrum :—

	5·0 to 7·0,	M. and P.
	6·3,	A. Rau (average of large number)
	4·0 to 6·0,	Squire (" Comp.")

Pix Burgundica :—

	0·2,	Moor

Podophylli Rhizoma :—

	2·9,	Priest

Pruni Virg. Cortex :—

4·2, Priest
4·0, „
4·6, M. and P.
5·1, „

Pterocarpi Lignum :—

1·7, M. and P.

Pyrethri Radix :—

6·0, Moor
5·3, M. and P.
4·9, „
Pulvis, 18·5, Priest
„ 17·5, „

Quassiæ Lignum :—

3·4, Moor
3·7, Priest

Quillaiæ Cortex :—

14·1, M. and P.
14·6, Moor

Rhei Radix :—

12·2, Moor
11·0, Priest
Pulv., 7·4, „

The ash in this article is naturally very variable.

Rhœados Petala :—

18·0, Priest

Rosæ Gallicæ Petala :—

2·8, Moor

Sarsæ Radix :—

6·5, M. and P.

Sassafras Radix :—

0·64, „

Scammoniæ Radix :—

11·1, Priest
10·9, „

Scammoniæ Resina :—

6·1, M. and P.

Scammonium :—

(*B.P. limit*, 3·0.)

Scilla :—

3·8, Priest
2·8, M. and P.
2·9, „
3·4, Priest
2·5, „
Pulv., 2·5, „

Scoparii Cacumina :—

3·5, Moor

Senegæ Radix :—

4·0, Moor
3·1, M. and P.
4·6, Priest
Pulvis, 24·0, „

Senna :—

5·6, M. and P.
Alexandrian, 10·5, „
Tinnevelly, 10·4, „
„ 9·1, „
„ 8·9, Priest
„ 7·2, „
„ 8·6, „

Serpentaria Rhizoma :—

8·9, M. and P.
30·7, „
10 1, Moor
13·4, „
6·0, Priest
7·1, „
Pulvis, 18·0, „
„ 18·4, „

Like arnica, this drug often carries a quantity of adherent earth. Possibly a limit of 9 per cent. might be suggested.

Sinapis :—

Black, 4·0 to 6·0, M. and P.
White, 5·0, „

Staphisagriæ Semina :—

26·0, Moor

This sample contained stones and dirt, the ash of the cleaned sample was 14·0.

Stramonii Folia :—

18·1, Moor
Powdered, 20·1, Priest

Stramonii Semina :—

3·0, M. and P.

Strophanthi Semina :—

10·8, Moor
3·8, Priest
5·4, Moor
4·0, „
3·4, „

Sumbul Radix :—

5·7, Moor

Thus Americanum :—

0·2, Priest

Tragacantha :—

2·9, Caines
4·9, M. and P.

Uvæ Ursi Folia :—

3·7, Moor

Valerianæ Rhizoma :—

8·0, Priest
8·6, M. and P.
13·7, Moor
15·1, „
19·5, „
Pulvis, 29·0, M. and P.

The ash of the cleaned rhizome will probably not exceed 9 per cent., any excess being adherent earthy matter.

Zingiber :—

3·0 to 5·0, M. and P.

African, Cochin, Jamaica: 3·0 to 8·0, Hockauf, *C. and D. Diary*, 1899, 266.
Brazilian 9·4

The PRESIDENT said so many drugs were used in powder that it would be very useful to have the ash determinations.

Mr. J. C. UMNEY said he had often found the black cochineal to contain 5 to 6 per cent. of ash.

Mr. W. C. ALLEN said there were two categories of articles, the ash of which had to be examined. As applied to drugs, undoubtedly the rules ought to be very stringent, and the limits very strict, but in the case of some other articles a considerable range might be

allowed with safety. In the case of pepper, for instance, some people would pay the highest price for the very best article, whilst to others the price was the leading factor; and in such cases he did not think a little extra ash was important. He understood that the rule laid down at Somerset House some few years ago was that no sample would be rejected merely on the question of ash if it answered the tests in other respects. The ash arose largely from the husk, and if it were clean and free from mineral matter, a little additional ash should not lead to condemnation.

Dr. ATTFIELD asked if Mr. Allen could throw any light on the statement of Dieterich that an immense difference in the proportion of ash in digitalis was noticed in different portions of one and the same parcel which had passed through sieves of different meshes. He had himself offered some suggestions on this head in his Report on the Pharmacopœia.

Mr. ALLEN said the matter was easily explained. In all drugs there were certain portions which were most easily powdered, which came away first, and what was left would naturally give a much larger proportion of ash; and the most easily powdered portion would, of course, pass through the finest mesh.

Dr. ATTFIELD said that showed the importance of sending all the portions through all the sieves, and of mixing all the products together.

Mr. J. C. UMNEY said all the leaves referred to by the previous speakers had very strong mid-ribs. Some three or four years ago Mr. Parker contributed a paper on belladonna root, showing how different portions passed through different sieves.

Mr. RUTHERFORD HILL said he could confirm the statement about the different proportion of ash in various samples of digitalis. This paper was practical and very useful. An ash determination was most useful as a preliminary examination as to the quality of drugs. He had recently a sample of asafetida, and in a fairly average sample there was 32 per cent. of ash. But it was absurd to talk of the percentage in a sample unless you ground up the whole caseful, because it was practically impossible to take an average sample. In the case he referred to, though it was of high quality and price, there were large masses of stone; in picked tears from the same case he found from 9·5 to 10 per cent., but even amongst the picked tears there were considerable masses of calcium sulphate here and there. Carefully picked tears, free from all extraneous matter, yielded about 1·6 per cent. of ash, never up to 2 per cent., and the ash was entirely and freely soluble in hydro-

chloric acid. His opinion was that any ash not so soluble was due to extraneous matter. He thought, therefore, that the ash limit should be considerably raised. The quantity of asafetida used medicinally was very small, and when used in pills he thought the use of the pure gum resin, having not more than 3 or 4 per cent. at the outside of ash, should be insisted on. For liquid preparations, tinctures, and so on, he would suggest that it would be sufficient to have a standardised tincture yielding a certain percentage of the gum resin on evaporation.

Mr. NAYLOR said he did not understand why the silver-grained cochineal should be so much in demand, for it yielded less colouring matter. But it was sold very largely by chemists, and the ash varied from 20 up to 50 per cent. He would suggest that chemists should rather keep the B.P. cochineal.

Mr. WRIGHT (Yeovil) said chemists had to supply what their customers demanded. He lived in a cider district, and though he endeavoured to sell the black grain, it was always refused. If the other was a little deficient in tinctorial power, this was made up by adding more of it.

Mr. SAGE said he believed the greater portion of the araroba sold was judged largely by the percentage of ash. Of several hundred samples he had examined during the last four or five years, he found the ash varied between 0·5 per cent. and 85 per cent. and such variation had a considerable effect on the price of the article.

Dr. SYMES thought the reason why silver grain cochineal was sold so largely was because it was about 1*d.* a pound cheaper.

Mr. J. C. UMNEY said silver grain cochineal could be got at any price, according to the amount of dressing. The best was relatively the cheapest.

Mr. BASCOMBE supported the suggestion made by Mr. Moor with regard to benzoin and benzoic acid.

Mr. H. E. BOORNE did not think the dark grain cochineal was always lower in ash than the silver grain; it sometimes contained 17 to 20 per cent., although a good price was paid.

The PRESIDENT said as far as his experience went asafetida could be obtained in commerce as nearly pure as it was collected; or you could have it adulterated to any extent; it was largely a matter of price. He had a letter from a gentleman in Bombay, who offered to supply any quantity of pure asafetida within the limits of the B.P. at 1*s.* per lb. With regard to cochineal, he found that the silver grain was generally larger and finer, and looked cleaner than the reddish drug,—people had the idea that

the latter was inferior and had lost its bloom. People would have what they were accustomed to.

Mr. Moor said he thought the only way out of the difficulty with asafetida would be to give the natives a little more, and ask them to send the stones in another box—they were just the same colour and appearance as the asafetida, and were evidently additions. With regard to tinctures, he might mention that four firms were now offering it, with a standard of 10 per cent. of total solids, which was perhaps the best thing at the moment, though it did not quite meet the difficulty, because in evaporating there was a certain loss of oil. The question raised as to the grading of pepper was interesting; no sample of graded pepper even containing a large proportion of ash, provided it was not sand or dirt, would be condemned on that ground alone. They were not paid much for analysing pepper samples, but they generally did more than determine the ash. With regard to red pepper, in some experiments the seeds were entirely separated, and analysed separately, but the results were practically identical. With regard to ether extract, ash, and fibre determination, this was done by Mr. Stock, of Darlington, to see if grading and sifting made any difference. He felt sure that the limit he suggested, of 5 to 7 per cent. for black pepper, and 1 to 3 for white, would cover all genuine specimens, however sifted. In the case of dark cochineal, oxide of iron had been found as an adulterant to the extent of 10 to 15 per cent. There was no objection to the white, but it should be sold as cochineal plus French chalk. He should certainly put the Inspector on to it in his district if he were aware of any such article being used in medicine. Different specimens of Tinct. Card. Co. varied enormously in colour, and this was no doubt due to the use of adulterated cochineal.

The authors were thanked for their most useful paper.

The next paper was on :—

SOME PHARMACEUTICAL AND ECONOMIC PLANTS OF JAMAICA.

By Theo. H. Wardleworth.

Within the narrow limits of a paper such as the present it is impossible to deal with all the plants grown in Jamaica which might be called "pharmaceutical." The writer simply intends

to briefly summarise and comment upon some of the leading pharmaceutical and economic products of Jamaica which have recently come under his notice. He has to thank the Director of Public Gardens and Plantations in Jamaica (Hon. William Fawcett, B.Sc., F.L.S.) for the photographs shown, and for his kindness during the writer's recent visit to the Island of Springs.

Annatto (*Bixa orellana*).

This plant grows freely in different parts of the island, and were it not for the introduction of aniline dyes would provide a contribution to the revenue of Jamaica. At present little or no system seems to be adopted in its cultivation and collection by the peasant.

Kola (*Sterculia acuminata*).

This grows freely, and the product is of first-class quality, but it does not seem to compete successfully with the African variety, probably on account of the greater cost of production.

Coca (*Erythroxylon coca*).

This can be grown in the island successfully, but apparently has not reached the commercial stage so far.

Oranges (*Citrus aurantium*, *Citrus vulgaris*, etc.).

The climate of Jamaica is admirably suited for the growth of all descriptions of oranges, and were it not for the present regulation of the B.P. enforcing the making of tincture from fresh peel, it might be possible for Jamaica to produce an unlimited supply of dried orange peel of excellent quality. It is to be feared that the present price obtainable for good peel would hardly call much attention to this article as a product worthy of cultivation.

Essential Oil of Limes.

This is produced freely in different parts of the island, chiefly during the process of concentrating lime juice for citric acid manufacture.

Jamaica Dogwood (*Piscidia erythrina*).

Some years ago the writer's attention was called to a parcel of dogwood bark, said to be from the root of the *Piscidia erythrina*. It contained a large amount of chlorophyll, and was evidently bark taken from the ascending axis of the tree. He endeavoured to

find out whether it was really taken from roots which might have been partly exposed to the air and light, but in this he was not successful. During his recent visit, he found, as the result of inquiries, that a very large quantity of bark from trunks of the trees had been shipped, as the collectors were not aware at the time that the root bark was required, and this probably explains the presence of chlorophyll in the parcel in question. He found that the proportion of root bark exposed by the *Piscidia erythrina* was very small indeed, and would only allow of a very small percentage in any parcel of the root bark.

Cowhage (*Mucuna pruriens*).

This grows freely all over the island and can be produced in quantity, but the natives seem to possess an unusual dread of this drug. The peasant when asked to clear a piece of bush in which cowhage may be growing is willing to do so if allowed to burn the bush, but not otherwise.

Balsams of Peru and Tolu.

The trees yielding these balsams grow freely in the island, but apparently the drugs are not produced commercially.

Pimento (*Pimenta officinalis*).

This is peculiarly a Jamaican tree. Efforts have been made to grow it in other islands in the West Indies, but without success. A grove of pimento trees is an interesting sight to the novice. The bark peels off every year in thin quills leaving the fresh bark of light cinnamon colour, giving the impression that the tree has been freshly peeled. The gathering of the berries is commenced as soon as the first berry in the bunch has ripened, and a peculiar feature of the collection is that each bunch has to be broken off, and not cut. If the branch be cut with a knife it will die down for some considerable distance after the operation; if broken by the hand the wound heals with little or no loss, and the tree bears well again the following year. The berries are carried to a barbecue, and there allowed to ripen and dry in the sun. The odour round a pimento planter's house during the season is almost overpowering.

Papaw (*Carica papaya*).

This grows well in all parts of the island, and papain could be made in almost any quantity should sufficient demand arise.

Colocynth.

Efforts are being made to grow this, as the plant flourishes well, but the natives so far lack the necessary skill in preparing it for the market. The Director-General is still devoting attention to the matter, and it is possible that before long Jamaican colocynth may be an article of commerce.

Ipecacuanha (*Cephaelis ipecacuanha*).

An effort is now being made at the Castleton Gardens and at the Hope Gardens, in Jamaica, to grow the Brazilian variety of ipecacuanha from seed imported from Brazil, and this is an experiment which will be watched with considerable interest by pharmacists.

Cinchona

Has been cultivated in Jamaica for some years past, on the slopes of the Blue Mountains, on the ridges rising from 3,000 to 6,000 feet. While the cinchona plantations have accomplished the aim of its founder, Sir J. P. Grant, like many other things they have fallen upon evil times, and in 1887 ceased to be a commercial asset, as the fall in the value of quinine reduced their profits to such an extent that they did not pay to work. The recent rise in the price of the alkaloids has drawn fresh attention to this effort of the Jamaicans, and during the past year the Director of the Public Gardens has tried to attract the attention of quinine makers to the resources of the island in this respect, but the incurrence of the difficulty and expense of establishing a quinine factory on the spot after the model of the Java factory is not warranted by the quantity of cinchona available. There are only a little over 22,000 trees, and the yield of bark per annum is about 120,000 lbs., which is only about one-thousandth part of the world's consumption. It is, therefore, to be feared that unless the bark can be profitably stripped, dried, and exported, this industry will have to remain idle for many years.

Olives (*Olea europæa*).

It has been found impossible to grow the olive tree successfully in Jamaica. The tree itself flourishes well, but bears no fruit. This is apparently due to the lack of rest which the tree finds in Jamaica, and which is given to it in the more temperate climate of Europe.

Lemon Grass Oil and Ginger Grass Oil.

These are being experimentally grown in the Hope Gardens, and seem to be flourishing well in their new surroundings.

Camphor (*Cinnamomum camphora*).

An effort is being made to introduce the cultivation of the camphor tree, and this is an experiment which will be watched with interest.

Castor Oil Plant (*Ricinus communis*)

Flourishes with little or no attention, and is to be found growing wild in many parts of the island. The oil could no doubt be produced commercially if sufficient inducement were offered.

Cardamoms (*Elettaria cardamomum*).

These are being grown, but not systematically. They evidently would do well in many parts of the island.

Ginger (*Zingiber officinale*).

The Jamaica ginger is of admittedly superior quality, and a great deal of attention is now being paid to its cultivation, chiefly by small colonies of Germans who are introducing improved methods in its growth and preparation. It used to be said by the planters and natives that it was a very exhausting crop, and could not be grown repeatedly on the same soil. This led to its being grown on virgin soil as far as possible, and when the plantation had been exhausted fresh ground was broken up, and the old fields were entirely neglected. To such an extent has this system been adopted that in a large number of instances the fields were at a great distance from the dwellings attached to the primary plantation. The German method of cultivation is "intense," and, by the adoption of a suitable fertiliser, very satisfactory results are obtained from the same fields year after year.

Vanilla.

Considerable attention has been devoted to the cultivation of the vanilla orchid in Jamaica by Mr. Fawcett, and the writer was privileged to see some exceptionally fine pods which had been grown and cured in the Hope Botanical Gardens. The director of plantations is distributing a large number of vanilla plants among suitable locations in the island, and in the course of a few years Jamaican vanilla may become an important factor in the vanilla yield of the world.

Areca Catechu (*Areca catechu*).

This palm grows freely in suitable parts of the island, and in connection with it the writer was able to set another question at rest. Some years ago a parcel of "split" areca nuts was offered on the London market. The quality was very unsatisfactory and yielded a very poor powder. Upon examination the writer was satisfied that they had been allowed to lie upon the ground until they had germinated and commenced to grow, but this could only be a theory. While in the Castleton Gardens he was fortunate enough to find a large number of areca nuts at the base of one of the palms. They had sprouted, and the young palms had grown to the height of several inches. They were taken up and examined carefully, and the cotyledons exhibited all the characteristics of the so-called split arecas.

Cocao-nut Butter (*Cocos nucifera*).

A German showed the writer some specimens of a remarkably fine butter which he had manufactured from the oil of the cocao-nut tree. It was said to be very easily digested by persons of weak digestive powers, and was an excellent substitute for lard in the making of ointments. It kept well and did not readily go rancid. The maker was exceedingly anxious to bring it under the notice of pharmacists and others to whom it might be useful.

Sarsaparilla (*Smilax officinalis*)

Naturally claims special attention, but upon this point very little can be said, as the plant did not come specially under the writer's notice. To throw some light upon this point, a short excursion was made into the bush in order to find, if possible, some native sarsaparilla, but the search was not successful. One small plant was found, but it was not in flower. The roots seem to be gathered by the negroes in small parcels, and sold to the merchants from time to time, but no special effort seems to be made for its cultivation.

Conclusion.

The impression produced upon the writer by his visit to Jamaica was that in view of the present struggling condition of our West Indian colonies it was desirable that the attention of pharmacists should be drawn to our own colonies as a source from which to draw their supplies of drugs more freely than is at present the case. With some slight measure of encouragement it would be possible to draw supplies of many drugs which at present come

from other parts of the world in which the mother country has little or no interest, and it is to be hoped that in the course of a few years the wise and energetic efforts of the directors of the various botanical stations may be crowned with abundant success. Of course climate has a remarkable influence in modifying the therapeutic value of many drugs, but experience would very soon show if the elements of the various drugs were unduly altered by their cultivation in Jamaica and the other West Indian islands. The authorities and the colonists are exceedingly anxious to do all they can to extend the cultivation of the plants mentioned, and any others for which there may be a demand; and the writer's hope is that the present brief note may tend to draw more pronounced attention to the capabilities of our West Indian possessions in providing pharmacists with what they require.

The PRESIDENT said they were much indebted to Mr. Wardleworth, who had taken the trouble when travelling abroad not merely to amuse himself, but to bring home instructive notes for their benefit.

Dr. ATTFIELD asked Mr. Wardleworth if he had met with any non-official drugs which seemed likely to be of use medicinally.

Mr. MARTINDALE, who had visited Jamaica at the beginning of last year, said the finances of the country were in such a condition that it was proposed to impose a tax on the exportation of logwood. Not much of that logwood came to this country, the greater portion going to Portugal, where it was used for a purpose which he need not refer to. Mr. Wardleworth had said that there were only 22,000 cinchona trees in existence, but this he thought was understating it. No mention was made in the paper of the banana export, which was now becoming very important. Last year a ship left for America daily laden with bananas, which were of a very fine kind. *Cactus grandiflora*, which grew abundantly in some parts of the island, he believed would be found to be valuable medicinally. Although the island of Jamaica was so poor, there was no real poverty among the natives, who were as happy-go-lucky a race as would be found anywhere.

Mr. DRUCE said, with regard to the olive tree, it was hardly expected that this plant, which did best on the Mediterranean coast, should bear a large amount of fruit in such a humid atmosphere as the West Indian Islands. In Algeria, where they had quite a cold winter, the plants had that period of rest which was necessary to allow a tree to give a crop of fruit during the summer.

Mr. Boorne thought that probably by next summer we should see Jamaica bananas on the English market.

Mr. Wippell Gadd said some time ago there was a dispute as to whether a tincture made from the dried plant of *Cactus grandiflora* was as valuable as a tincture made from the fresh plant, and a friend of his had made experiments on this subject. He understood from what Dr. Gordon Sharpe had published at Edinburgh he conclusively proved that the genuine plant and the false plant were equally useless medicinally.

Mr. Rutherford Hill could confirm the statement that neither the genuine plant nor the spurious plant had any qualities which would justify their retention as a medicinal agent.

The President said Mr. Johnson, who had just come from Jamaica, had brought him some specimens of the Jamaica sarsaparilla.

Mr. Johnson said he had great difficulty in getting the specimens which he had brought to Mr. Holmes. During his stay in Jamaica he was in close touch with the medical officers throughout the island, and he learned of several marvellous cures performed by the bush doctors after qualified men had given the cases up. There was ample scope in Jamaica for an investigation into the plants: the number of which used for malarial disorders was enormous.

The President said Mr. Wardleworth's paper was interesting from many points. He thought the colocynth might be sent over to this country if properly prepared. Some time ago they had some colocynth sent over from Persia, but those who had not examined it carefully would not believe that it was the real thing. He had had some specimens of cinchona from Jamaica, and came to the conclusion that they had not the best species in cultivation. Then referring to ginger, he hoped the inventive genius of the English would produce a machine which would deprive the ginger of its cortex. A large fruiterer in the City told him that the most delicious oranges were those that came from Jamaica, but they were packed so indiscriminately as to be unsaleable. With regard to *Cactus grandiflora*, they knew that some of the cactus family had very powerful medicinal properties, and he could see no reason why the *Cactus grandiflora* might not also be of value.

Mr. Wardleworth thanked the members for their reception of his paper. He thought it would be a good thing if Mr. Johnson would pursue his investigations, and if he were to communicate the result of his inquiries to Dr. Attfield they would be able to

add to the known drugs. The bush doctors in his experience did not always rely on native remedies. Calomel was a favourite remedy with them. The number of cinchona trees on the island had been supplied to him by Mr. Fawcett; it was possible that many had been destroyed. The people in this country could not appreciate the difficulties under which their friends in the tropics laboured in bringing up their crops. On a day in last November there was a crop of bananas estimated to be worth £100,000, but in the space of a few minutes that crop ceased to exist, a semi-hurricane having razed it to the ground. With regard to the indisposition of the natives to work, they argued that if they had enough for their wants there was no occasion to do anything further.

A hearty vote of thanks was passed to the author.

The following paper was then read:—

LABORATORY NOTES.

By F. C. J. Bird.

Liquor Pancreatis, B.P.

The test given in the Pharmacopœia for verifying the proteolytic activity of the official pancreatic solution reads as follows:—"If 2 c.c. of the solution, together with 0·2 gramme of sodium bicarbonate and 20 c.c. of water be added to 80 c.c. of milk, and the mixture be kept at a temperature of 113° F. (45° C.) for one hour, coagulation should no longer occur on the addition of nitric acid."

The test as it stands is hardly as definite as it might be, and at times the point at which coagulation no longer occurs is rather difficult to determine. The amount of nitric acid added also is not without importance. For example, taking 5 c.c. of fresh milk the following effects were produced by varying quantities of nitric acid.

Effects of Nitric Acid on Milk.

To 5 c.c. milk:—

Nitric acid	♏ i. . . .	Very fine curd, barely perceptible.
,,	♏ ii. . . .	Coarser curd.
,,	♏ iv. . . .	Increased coarseness.
,,	♏ vi. . . .	Maximum coarseness.
,,	♏ viii. . . .	Faint tinge of yellow.
,,	♏ xii. . . .	Full yellow colour.

All settled on standing, leaving about 10 per cent. of clear supernatant liquor. The amount of nitric acid used therefore affects the size of the masses of curd, and excess turns the liquid to a pink or yellow colour.

The test is rendered much more sensitive and definite by the use of ether with the nitric acid.

5 c.c. of fresh milk shaken with 5 c.c. of 0·717 ether yields a white *opaque* liquid, which on the addition of 5 minims of nitric acid coagulates to a perfectly solid mass.

5 c.c. of milk after treatment for one hour, as directed in the B.P., with the prescribed quantity of liq. pancreatis of official strength, when shaken with an equal volume of 0·717 ether, furnishes a *clear* solution, the appearance of which is scarcely changed by the addition of 5 minims of nitric acid. Any coagulated caseine will be found to rise as a layer between the liquids, but in a sample of full B.P. strength the amount of separated curd should be infinitesimal. It is therefore suggested that the wording of the official test might be advantageously modified by the substitution after the words "for one hour" of the following sentence:—"5 c.c. of the liquid shaken with an equal volume of 0·717 ether should form a clear solution, in which no coagulation should be produced on the addition of 5 minims of nitric acid."

The Barium Chloride Test for Carbonate in Aromatic Spirit of Ammonia.

The precipitation test with barium chloride for ensuring the presence of a due proportion of carbonate in spirit ammon. aromat. was first introduced into the 1885 Pharmacopœia, and with some modifications passed into the last edition of the B.P. This method was generally accepted as accurate until Edmund White, in an admirable and thorough investigation of the whole subject of spirit ammon. arom., recently communicated to an evening meeting of the Pharmaceutical Society (*P.J.* [4], 10, 144), conclusively proved that its indications were delusive and unreliable. 20 c.c. of the spirit and 16 c.c. of the solution of barium chloride are the quantities mentioned in the Pharmacopœia which should, after reaction and filtering, yield a further precipitate when more of the reagent is added and the liquid again heated. Experiments were described in Mr. White's paper which showed that any quantity of spirit from 18 to 23 c.c. substituted for the 20 c.c. fulfilled this requirement, further precipitation taking place in each instance. It seems unfortunate that this test is so unreliable, as it possesses

the merits of simplicity and ease of application, especially as the only alternative is the more complicated method dependent on the measurement of CO_2 in a nitrometer, a method also not without disadvantages. The subject of this note is the result of an attempt to render the barium chloride test sufficiently accurate to fulfil the purpose for which it was intended. When the solution of barium chloride is added to the aromatic spirit of ammonia a precipitate falls which is of a more or less gelatinous nature, and on heating to 160° F. the aggregation of the precipitate is not very decided. These facts point to incomplete reaction, and it appeared probable that advantage might be taken of the property which the chlorides of sodium or ammonium possess of throwing other substances out of solution, which is often found useful in other analytical operations. Varying quantities of ammonium chloride were therefore added to the reacting solutions, and in the presence of this salt the appearance of the precipitated barium carbonate underwent an immediate change. It lost its gelatinous character entirely, and settled at once to the bottom of the liquid as a fine white granular powder. The exact manner of conducting the test is as follows:—To 20 c.c. of the aromatic spirit of ammonia add 5 grammes of ammonium chloride, agitate vigorously, and add 16 c.c. of solution of barium chloride. Warm to 160° F., cool to normal temperature, and filter. The filtrate on the addition of more barium chloride and warming gives no further precipitate. Should a slight opalescence be produced by the barium chloride it should disappear completely on heating, but any precipitate of barium carbonate would remain permanent. 21 c.c. of aromatic spirit of ammonia tested under exactly similar conditions will be found to yield a precipitate on the further addition of barium chloride, which does not disappear on warming. The reaction appears to be quite complete at the time of filtering, as is evident from the following table:—

16 *c.c. Barium Chloride Solution.*

Spt. Am. Ar. taken.	Filtrate on Standing.	$BaCl_2$ to portion of Filtrate.	Am_2CO_2 to portion of Filtrate.
20 c.c.	No ppt.	Faint opalescence which disappears on warming.	Ppt.
21 c.c.	No ppt.	Permanent ppt. on warming and allowing to stand for ten minutes.	No ppt.
22 c.c.	No ppt.	Copious ppt.	No ppt.

With quantities of aromatic spirit of ammonia varying from 18 to 25 c.c. to 16 c.c. of the barium chloride solution, in no case did any further precipitate form on allowing the clear filtrate to stand for twenty-four hours.

The Solubility of Pepsin in Alcohol.

What is the solubility of pepsinum, B.P., in 90 per cent. alcohol? A. H. Allen[1] gives the solubility as 1 part in about 10 parts of alcohol of 90 per cent. The British Pharmacopœia requires pepsin to be "soluble in about 100 parts of alcohol (90 per cent.)." Squire (*Companion*, 466) says, "almost insoluble in alcohol (90 per cent.)," and the United States Pharmacopœia (1890) states that pepsin is "insoluble in alcohol."

Certainly the bulk of the B.P. pepsin met with in commerce, although agreeing with the official requirement in point of proteolytic power, does not possess anything like the degree of solubility indicated in the Pharmacopœia. The following are the solubilities in 90 per cent. alcohol of three samples of pepsin, two of which were of full B.P. strength, and the third of very much higher digestive power. One part of the pepsin was agitated with the 100 fluid parts of (90 per cent.) alcohol during four days, and the filtrate evaporated and dried to a constant weight :—

Physical Appearance.	Strength.	Per Cent. of one part dissolved by 100 vols. 90 per cent. alcohol.
1. Transparent scales	Full B.P.	37
2. Yellowish powder	B.P.	17
3. Nearly white powder	Much above B.P. strength.	29

I have never met with a sample of pepsin which would answer to the description of being "soluble in about 100 parts of alcohol (90 per cent.)," and in this particular the official monograph appears to require amendment.

The President, in inviting discussion, said whenever they had a paper from Mr. Bird they knew there was something good in it.

Mr. Farr said he quite confirmed Mr. Bird's results. At a previous Conference Dr. Attfield referred to the Pharmacopœia as a casket of gems more or less polished, and he (Mr. Farr) congratulated Mr. Bird on the way he had polished them up.

[1] *Com. Org. Anal.*, 1898, vol. iv. 344.

Mr. MAIR said the general experience was that pepsin was insoluble in alcohol.

Mr. C. TYRER gave it as his general experience that pepsin was not soluble in alcohol.

Mr. GERRARD asked whether the portion of pepsin which was soluble in alcohol was considered of more value than the insoluble portion. In his opinion, the value of the test depended upon the answer to this question. His own opinion was that the insoluble portion was the most valuable. It was a mucus-like substance of an albuminous nature. If they prepared pepsin in the ordinary way, and wanted to be quite sure they had a fairly active product, it could be got by adding to the moist scrapings an abundance of alcohol, throwing down the pepsin as precipitate: they might disregard the soluble portion, and would have a good pepsin.

Mr. MARTINDALE thought that the part soluble in alcohol was principally peptone.

Dr. SYMES wished to emphasise what Mr. Gerrard had said. In experiments he had made he used alcohol, and found that the portion that remained soluble in the alcohol solution had very little digestive properties as compared with the portion precipitated by the alcohol; therefore, one would imagine that it was scarcely a suitable test for pepsin to require it to be soluble in alcohol.

Mr. ALCOCK said he had seen an interesting experiment, which demonstrated that the method of adding ammonium chloride could be improved upon. Barium chloride in solution was placed before him, and sodium carbonate in a peculiar shaped test tube used for milk analysis was added—after giving a twist to it in a centrifugal machine, the precipitate of the barium carbonate remained in a mass at the bottom of the tube. He thought the intervention of ammonium chloride was of doubtful value.

Mr. WATSON WILL suggested that they should have a volumetric test for Spt. Ammon. Arom.

Dr. MCWALTER did not wish to unduly criticise Mr. Bird's suggested alteration, but it seemed to him to be taking a frightful liberty with the test. In an ordinary aqueous solution they knew that nitric acid would precipitate certain albumens, but they were told that as a slight modification of the test that it should be shaken up with an equal volume of ether. He should like to see the test improved upon, but he thought Mr. Bird's suggestion would involve a radical alteration of the reaction. With regard to the solubility of pepsin in alcohol, he did not think the preparation which had been referred to was the same preparation as in the

Pharmacopœia. What was spoken of as pepsin was merely a substance containing a certain proportion of the unorganised ferment. In his opinion, the alcoholic test went for very little.

Dr. ATTFIELD said this paper was the kind of paper which was most welcome to the Medical Council, and Mr. Bird's attitude towards the Pharmacopœia was most loyal.

Mr. BIRD agreed with what Mr. Gerrard had said as to the valuable portion of the pepsin. The sample of B.P. pepsin was soluble to the extent of 37 per cent. of the proportion mentioned in the Pharmacopœia, while the nearly white powder was only soluble to the extent of 29 per cent., therefore with less solubility you get double the proteolytic power. With regard to what Dr. McWalter had said about taking liberties with the test, he could not admit that, and he would ask Dr. McWalter to try the test side by side with the Pharmacopœia method when he would at once see the advantage of the addition of ether.

A cordial vote of thanks was accorded to Mr. Bird for his series of practical notes.

The following paper was then read :—

EXAMINATION OF COMMERCIAL SAMPLES OF LIQUOR FERRI PHOSPHATIS CUM QUININA ET STRYCHNINA.

BY H. J. HENDERSON.

The introduction of syrupus ferri phosphatis cum quinina et strychnina into the British Pharmacopœia has created a demand for a concentrated liquor with which the syrup can be easily prepared. This liquor usually has a strength which is four times stronger than the syrup, and should therefore contain 4·596 grammes of total alkaloids in 100 c.c., when the alkaloids are calculated as being anhydrous. From the prescriber's point of view no legitimate objection can be taken to the use of these concentrated liquors in dispensing, provided that when diluted the resulting syrup represents the official article. I feel that some apology is necessary for introducing to the members of the British Pharmaceutical Conference a subject of this kind. My excuse is an earnest desire to secure uniformity of strength in a remedy of such potency. Moreover, the indiscriminate use of these concentrated preparations has a tendency to degrade the trade, and

is responsible to a very great extent for the ignorance of so many candidates for the Minor Examination. It is a matter of common knowledge that in the examination-room syrupus ferri iodidi of the last Pharmacopœia was more often spoiled than not by the would-be chemist and druggist, and I have not the slightest doubt that it was simply because their experience was confined to making it from a concentrated liquor. I have had occasion to prepare liquor ferri phosphatis cum quinina et strychnina in considerable quantities from time to time, the retail trade, or a part of it, having created a demand which the wholesale houses very naturally do their best to supply. After some considerable experience I have no hesitation in asserting that a liquor of the strength mentioned above, which when diluted shall fairly represent the syrup of the Pharmacopœia, cannot be prepared, but there is no reason why the syrup itself should not be prepared in the humblest pharmacy. The contents of the bottle either become perfectly solid or an insoluble block of alkaloids surmounted by a red liquor half fills the bottle. This block is not to be dissolved by heating. Being well aware that many liquors were sold which did not act in this manner, I purchased samples from various places in various parts of the country, and estimated the total percentage of alkaloid in each. The labelling of the samples calls for some comment. The British Pharmacopœia has not adopted the term Easton's syrup as a synonym for syrupus ferri phosphatis cum quinina et strychnina. Nevertheless, five of the ten samples examined used the term Syr. Easton, B.P., 1898, as a substitute for the official name, which shows that some portion of the trade at least are adopting the term "Syrup Easton" as a synonym for the official syrup, a course which will probably give rise to discussion in the future as to what ought to be dispensed when "Syr. Easton" is ordered in a prescription. The method I adopted for the isolation of the alkaloids was as follows:—5 c.c. of the liquor were measured into a stoppered glass separator, ammonia solution being added to a strongly alkaline reaction, the alkaloids were then shaken out with chloroform in the usual way. The chloroformic solutions were drawn off into a tared dish, allowed to evaporate spontaneously, and the residues were then dried in the air-oven at 110° C. It will be noticed that the residues were dried at 110° C. instead of 120° C. This was an oversight due to following the temperature ordered in the Pharmacopœia for drying the alkaloids in extractum cinchonæ liquidum, a temperature of 120° C. being necessary to eliminate the last

traces of water from quinine. Time, however, prevented me from repeating all the estimations. In order to calculate approximately the weight of the residues as anhydrous, I re-estimated No. 1, using 10 c.c., and it was found that the residue lost 0·0155 grammes between 110° C. and 120° C., which reduces the weight to 4·665 grammes in 100 c.c. As the figures, however, have a commercial and not a scientific interest, I have no hesitation in publishing them, for the only result of drying at 120° C. would be to further reduce the weight of total alkaloid, which, in seven of the samples examined, was found to be deficient at the lower temperature. Nos. 1, 5, and 10 may be taken to contain the theoretically correct amount of alkaloid, the high figures being accounted for by the temperature at which the residues were dried. The table below gives the results at a glance:—

No. of Sample.	Gm. of Total Alkaloid in 100 c.c.	Remarks.
1	4·82	Chlorides present, Sulphates absent.
2	1·30	Chlorides absent, Sulphates present.
3	1·25	Chlorides absent, Sulphates present.
4	3·91	Chlorides absent, Sulphates present; alcohol present.
5	4·88	Chlorides present, Sulphates absent.
6	4·14	Chlorides present, Sulphates absent,
7	3·76	Chlorides absent, Sulphates and glycerin present; a syrupy liquid.
8	4·44	Chlorides present, Sulphates absent.
9	3·65	Chlorides present, Sulphates absent.
10	4·84	Chlorides present, Sulphates absent.

All the samples which contained over 4 grammes of alkaloid in 100 c.c. gave unmistakable reactions for chlorides, a circumstance which points to the probable substitution of the acid hydrochloride of quinine for the less soluble sulphate. When it was found that sulphates were conspicuous only by their absence the supposition received further confirmation. Of the other samples, No. 4 differed from the others in that it contained alcohol in considerable quantity, but the small amount of liquor at my disposal made a trustworthy estimation of alcohol impossible. I will content myself with allowing samples 2 and 3 to speak for themselves. No. 7 was a syrupy liquid and was found to contain glycerin, the glycerin playing the double part of preservative and solvent. All these results tend to confirm my previous impression,

that a liquor ferri phosphatis cum quinina et strychnina, one volume of which, when diluted with three volumes of simple syrup, shall form a syrup which shall represent the syrupus ferri phosphatis cum quinina et strychnina of the Pharmacopœia cannot be prepared. Samples 6, 9, and 10 were labelled simply "liquor Easton," pro syrup. They, therefore, could not be understood to represent a liquor with which the official syrup could be prepared.

The PRESIDENT said this preparation was very largely used, and it was one about which chemists might easily get into trouble, if it was not exactly what it ought to be.

Mr. PARKER said syrups containing iron were a great source of trouble in many pharmacies, especially where there was not a constant demand for them; and to meet the difficulty some pharmacists were accustomed to make use of what had been called concentrated abominations. Syrupus ferri iodidi caused no difficulty, there was no need for a concentrated liquor, it could be readily prepared so as to keep for any length of time in a satisfactory condition; but syrupus ferri phos. could not be prepared so as to keep any length of time without discoloration. This was readily met by a concentrated liquor ferri phos., of which 1 drachm represented 8 drachms of the syrup. In the case of what was called Easton's syrup he would advise the use of a simple liquor ferri phos. of 1 to 7 strength, one drachm of which should be added to 7 drachms of a syrup containing all the ingredients of Easton's syrup except the iron. This was readily made, filtered bright, and could be kept indefinitely.

Mr. ALCOCK asked if the author had taken the specific gravities and amount of acidity.

Mr. HENDERSON said that after making two estimations in each case there was not sufficient of the liquors left to take their specific gravities and determine their acidities. Mr. Parker's recommendation for making Easton's syrup was the method described in the Extra Pharmacopœia. He found that glycerin had a remarkable effect in retarding the decomposition of ferrous phosphate. The addition of one ounce to a pint of concentrated liquor in an amber bottle caused it to keep perfectly. He thought it would be an improvement if glycerin were substituted for a portion of the sugar and a little saccharin added if it was not sufficiently sweet. This particular syrup had been the cause of several deaths lately, which could easily be understood. If a patient had been in the habit of taking a syrup made from No. 1,

and then got one made up by another chemist from No. 2, he would not find the effect so strong and might be led to increase the dose. Then he might go to another shop and get No. 8, and, taking the same dose of that as he had been taking of No. 2, the result would be unpleasant, if not fatal.

Mr. HENDERSON was thanked for his paper.

The next paper read was on:—

THE RECOVERY OF WASTE MENTHOL.

By A. W. GERRARD.

Having in my possession 5 to 6 lbs. of impure menthol, the waste of some years of manufacture, I determined to attempt its recovery and purification. Two methods presented themselves for this purpose, viz.: (1) sublimation by heat, (2) crystallisation from solvents. Surmising that recovery by sublimation would give the best result, that process was first submitted to trial. For conducting the operation, a tinned iron vessel was constructed with a big outlet on its dome, to which was attached a long, wide stove-pipe, bent at right angles, to act as a condenser. Into the above vessel the menthol was placed, and heat applied by means of a water bath. The condenser was so arranged that a current of cool air could be passed over it. In my first experiment it was found if the water bath were kept at boiling point the menthol distilled and condensed in the stove pipe as an oil, which, as it flowed onwards, set to a hard solid of not satisfactory appearance. Thinking the temperature of the water bath was too high, it was now regulated to 140° F., at which temperature the distillation proceeded much more slowly, and the condenser in about eighteen hours became filled with a mass of beautiful silken filamentous crystals of exceeding softness and lightness; softer than the finest wool, and of high purity. This process, interesting as it proved, was much too slow to be of practical value, for so bulky was the menthol that it would have taken probably a week to recover a pound; I therefore relinquished sublimation and turned my attention to the method of recovery by crystallisation.

As a preliminary 20 gm. of the menthol was dissolved respectively in 20 c.c. of benzene, petroleum ether, carbon bisulphide, methylated ether, and acetone. Each solution was filtered through paper into a porcelain capsule and left to spontaneously evaporate. In a period varying from 12 to 24 hours all the solutions had deposited an abundance of crystals; these were drained from a

small quantity of mother liquor, placed on absorbent paper and air-dried for several hours. The menthol crystals obtained in each case were very beautiful, and almost colourless; a second crystallisation rendering them quite pure. All the solvents except ether left a residue of odour attached to the menthol which required two or three days of air exposure for removal. In the case of ether, however, a few hours' exposure was sufficient to volatilise all traces of foreign odour, and left the menthol in a high state of purity.

The above experiment having proved satisfactory, the bulk of the menthol was dissolved in half its weight of ether, filtered and crystallised; the crystals drained from the mother liquor were again dissolved in half their weight of ether and again crystallised. On drying, the menthol was obtained in the beautiful colourless crystals characteristic of that substance. As one pound of ether is ample for the two crystallisations of one pound of menthol the process is economical.

Mr. PARKER asked if there was any difficulty found in removing the mother liquor.

Dr. SYMES said they were much indebted to Mr. Gerrard for this paper, which would be much appreciated by those who made menthol cones. Some years ago he used to make a great many, and believed he still had somewhere a quantity of discoloured menthol which had been put aside as not worth dealing with in any practical manner, because it was found that sublimation was slow and unsatisfactory. Mr. Gerrard had given them a means by which a comparatively small quantity could be recovered with very little time and expense.

Mr. GERRARD, in reply, said there was no practical difficulty in getting rid of the mother liquor. He generally pierced the surface of the crystals, and, setting the dish on its edge, allowed it to drain: any which remained could be removed by placing the crystals on bibulous paper. You did not lose any menthol practically, because it could be recrystallised. An exceedingly small amount of colouring matter would give a decided tint to a large quantity of menthol, but a small amount of solvent would, on the other hand, remove a large proportion of that colouring matter. He should have much pleasure in presenting the specimens to the Museum.

Mr. GERRARD was thanked for the practical suggestions embodied in his paper.

The Conference then adjourned for luncheon.

On resuming, the following paper was read by Mr. Farr.

THE DETERMINATION OF STRYCHNINE.

A CRITICAL NOTE ON THE OFFICIAL PROCESS FOR THE ASSAY OF PREPARATIONS OF NUX VOMICA.

By E. H. Farr, F.C.S., and R. Wright, F.C.S.,

Pharmaceutical Chemists.

The pharmacopœial process for the assay of the preparations of nux vomica was devised by Dunstan and Short in connection with their research on the chemistry and pharmacy of nux vomica.[1] They showed that from a solution slightly acidified with sulphuric acid, strychnine was entirely precipitated in the presence of brucine, even when only 0·0015 per cent. of the former was present. They found that in the same conditions, precipitation of brucine did not commence until the quantity present in solution reached 0·06 per cent. They stated that the most complete separation of the alkaloids took place in a liquid containing 0·25 per cent. sulphuric acid.

The details of the process, as given by the authors, are as follows:—

"Any quantity less than 0·2 gm. mixed alkaloids is dissolved in 10 c.c., 5 per cent. (by volume), sulphuric acid, the solution diluted to 175 c.c. with diluted water, and the volume adjusted to 200 c.c., with a 5 per cent. solution of potassium ferrocyanide. The liquid is transferred to a beaker, stirred occasionally, and allowed to stand for six hours. The precipitate is filtered off and washed with water containing 0·25 per cent. sulphuric acid, until the washings are free from bitterness. It is then decomposed with strong ammonia water, the filter washed with the same liquid and finally with chloroform, a sufficient quantity of which is used to extract the alkaloid from its solution in ammonium hydrate. The chloroformic solution is evaporated and the anhydrous strychnine weighed."

The results of a number of experiments, showing the accuracy of the process, are recorded in the original paper.

The fact was noted that the strychnine residues contained traces of brucine, and the brucine traces of strychnine, which were removed by reprecipitation. Vigorous stirring of the solution with a glass rod, in order to induce precipitation, is highly recommended.

[1] *Pharm. Journ.* [3], xiv. 290.

Since the publication of the research of Dunstan and Short, the ferrocyanide process has been subjected to criticism by Schweissinger,[1] whose conclusions may be summarised as follows:—

(*a*) Strychnine ferrocyanide is perfectly insoluble in water acidulated with sulphuric acid.

(*b*) Brucine ferrocyanide is not completely soluble in acidulated water, but separates out at once in small quantity, and after some time almost entirely.

(*c*) Separation by this method does not give satisfactory results, those for the strychnine being always too high and the brucine too low, and being largely dependent upon the concentration of the liquid and the time occupied in the precipitation.

(*d*) Ferrocyanide salts decompose quickly in moist air into free alkaloid, ferricyanide and water.

The process has also been subjected to somewhat serious criticism by Harvey,[2] who showed that if the volume of liquid extract and tincture ordered in the Pharmacopœial assay process be taken, the quantity of alkaloid present would greatly exceed the maximum limit laid down by Dunstan and Short. He calculated that 10 c.c. liquid extract would frequently contain 0·32 gm. and 100 c.c. tincture 0·5 gm. alkaloids. In practically working the process he had found that in washing the precipitated ferrocyanides a considerable quantity of strychnine was carried into solution. In one instance no less than 0·012 gm. was recovered from 200 c.c. wash water. He reckoned that on an average 0·006 gm. strychnine was dissolved by 100 c.c. wash water. He proposed that the volume of wash water should be limited to 50 c.c., and that not more than 5 c.c. liquid extract or 30 c.c. tincture should be taken for each determination.

Before commencing practical work on the subject it was necessary to prepare a sufficient quantity of anhydrous brucine. Strychnine as met with in pharmacy is sufficiently pure. It is free from brucine, and practically anhydrous. Six gm. of the alkaloid exposed in an air oven at 100° C. only lost 3·5 milligrammes. Crystalline brucine of commerce is said to have the composition represented by the formula $C_{23}H_{26}N_2O_4 \cdot 4H_2O$, and should, therefore, lose on heating 15·45 per cent. Two portions were weighed out and maintained at a temperature of 110° C. till the weight was constant. (*a*) 0·109 gm. lost 0·0155 = 14·22 per cent. (by calculation, 0·0168); (*b*) 0·083 gm. lost 0·012 = 14·55 per cent. (by calculation, 0·0128).

[1] *Pharm. Journ.* [3], xvi. 447.
[2] *Chem. and Drug.*, liv. 61.

This showed the possible presence of a trace of strychnine, and we accordingly prepared a quantity of pure brucine by recrystallisation. Advantage was taken of the fact that brucine is much more soluble than strychnine, both in alcohol and water. Some commercially pure brucine was dissolved in hot 90 per cent. alcohol, the solution cooled, and water added until crystallisation commenced. The first portion of the crystals was rejected, more water was then added and abundant crystallisation induced. The crystals were separated, washed with dilute alcohol, dried, and finally rendered anhydrous, in order that the material operated upon might correspond in every respect with the alkaloid as weighed in the official assay process. Before dealing with that process it was thought essential to ascertain the conditions under which the respective alkaloids and mixtures of the two were removed from solution by potassium ferrocyanide.

Precipitation of Strychnine by Potassium Ferrocyanide.

A weighed quantity of the alkaloid was dissolved in water containing 5 c.c. of dilute sulphuric acid, the solution diluted with distilled water to 175 c.c., and made up to 200 c.c. with a 5 per cent. solution of potassium ferrocyanide. The mixture was placed in a beaker and stirred frequently. After six hours the precipitate was filtered off, portions of the clear filtrate being used to rinse out the beaker, and remove the last traces of the precipitate. This was washed with 100 c.c. acid water (containing 2·5 per cent. dilute sulphuric acid). The alkaloid in the precipitate was determined by decomposing with ammonia, shaking out with chloroform, evaporating, drying, and weighing. The following figures show the results obtained:—

Strychnine Taken.	Strychnine Recovered.
0·008 gm.	0·006 gm.
0·038 „	0·036 „
0·045 „	0·042 „
0·196 „	0·194 „
0·210 „	0·208 „

Temperature of liquids 62° F. to 68° F. Traces of strychnine were found in all the mother liquors and wash waters. A further experiment was made in winter, temp. 40° F. to 42° F. After the precipitate had been filtered off, the mother liquor was treated with ammonia and chloroform, and the chloroform evaporated. An insignificant trace of alkaloid was found, amounting to not more than $\frac{1}{5}$ or $\frac{1}{10}$ milligramme.

Precipitation of Brucine by Potassium Ferrocyanide.

According to Dunstan and Short, brucine is not precipitated from a slightly acid solution unless 0·06 per cent. is present. In order to test the correctness of this statement 0·12 gm. anhydrous alkaloid was dissolved in acid water as directed in the Pharmacopœia, potassium ferrocyanide added, and the solution well stirred. Precipitation commenced immediately, and in a few minutes quite a bulky precipitate had formed. The same was the case when 0·1 and 0·08 gm. brucine was dissolved and similarly treated. It was evident from the readiness with which precipitation took place that it might be induced in solutions even more dilute than those already operated upon. Similar solutions were therefore prepared containing respectively 0·06, 0·05 and 0·04 gm. anhydrous brucine. The temperature ranged from 60° F. to 70° F. At the end of six hours a distinct precipitate had appeared in each solution. They were allowed to stand for twelve hours, and were then filtered. Each precipitate was washed with slightly acidified water containing 0·5 per cent. potassium ferrocyanide, and the alkaloid in the precipitates and mother liquors determined.

The following results were obtained :—

	0·06 Solution.	0·05 Solution.	0·04 Solution.
Brucine from precipitate .	0·033 gm.	0·022 gm.	0·006 gm.
„ „ mother liquor .	0·023 „	0·026 „	0·032 „

These experiments were repeated in winter at a temperature of about 40° F., with the following results :—

	0·06 Solution.	0·05 Solution.	0·04 Solution.
Brucine from precipitate. .	0·047 gm.	0·041 gm.	0·025 gm.
„ „ mother liquor .	0·009 „	0·007 „	0·012 „

Precipitation of Mixed Alkaloids by Potassium Ferrocyanide.

Solutions of brucine of the strengths given above were made, 0·5 gm. strychnine added to each, the liquids well shaken with the potassium ferrocyanide and set aside for six hours. They were then filtered, and each precipitate washed with 100 c.c. acid water. The alkaloids were determined in the precipitate, mother liquor, and wash water, temp. 65° F. to 70° F. The following results were obtained :—

	0·06 Solution.	0·05 Solution.	0·04 Solution.
Alkaloids from precipitate . (impure strychnine)	0·056 gm.	0·055 gm.	0·058 gm.
Alkaloids from mother liquor.	0·043 „	0·033 „	0·028 „
„ „ wash water	0·007 „	0·005 „	0·004 „

The impure strychnine was redissolved and reprecipitated, and the alkaloid in the precipitate and mother liquor determined. The following amounts of alkaloid were obtained :—

	0·06 Solution.	0·05 Solution.	0·04 Solution.
Alkaloid from precipitate .	0·048 gm.	0·047 gm.	0·048 gm.
„ „ mother liquor .	0·005 „	0·008 „	0·005 „

These experiments were repeated in winter at temperatures ranging between 38° F. and 45° F. The results came out as follows :—

	0·06 Solution.	0·05 Solution.	0·04 Solution.
Alkaloids from precipitate .	0·056 gm.	0·054 gm.	0·058 gm.
„ „ mother liquor.	0·049 „	0·039 „	0·026 „
„ „ wash water .	0·005 „	0·005 „	0·005 „

On redissolving the impure strychnine and re-precipitating we got as follows :—

	0·06 Solution.	0·05 Solution.	0·04 Solution.
Alkaloid from precipitate .	0·049 gm.	0·048 gm.	0·051 gm.
„ „ mother liquor .	0·005 „	0·004 „	0·005 „

We next made two series of experiments with solutions containing the mixed alkaloids in quantities and proportions so varied as to cover the range likely to occur in volumes of 5 c.c. and 10 c.c. of the liquid extract. The first of these series of experiments were conducted during the hottest part of the summer, and the second in winter, at a temperature not above 40° F.

NOTE.—Nux vomica seeds contain from 1·6 to 5 per cent. alkaloids (D. and S.). ∴ 10 c.c. 1 in 1 liquid extract would contain 0·16 to 0·5 gm. total alkaloids. The average proportions are 1 S. to 2 B. 10 c.c. would therefore contain from $\left\{\begin{matrix}0{\cdot}05\text{ S.}\\0{\cdot}12\text{ B.}\end{matrix}\right\}$ to $\left\{\begin{matrix}0{\cdot}17\text{ S.}\\0{\cdot}33\text{ B.}\end{matrix}\right.$

SUMMER SERIES.

Strychnine taken.	Brucine taken.	Volume of wash water.	Strychnine found.
0·150	0·300	100 c.c.	0·151
0·150	0·200	100 „	0·148
0·150	0·100	100 „	0·149
0·150	0·300	400 „	0·139
0·075	0·150	50 „	0·079
0·100	0·150	50 „	0·106
0·075	0·050	50 „	0·080
0·075	0·150	50 „	0·080

The above determinations were made strictly by the official process—all the conditions as to length of time allowed for precipitation, etc., being literally followed. They are both suggestive and remarkable, showing that in certain circumstances strychnine may be perfectly removed from a solution supersaturated with brucine ferrocyanide without the latter being removed in any appreciable quantity.

Winter Series.

Strychnine taken.	Brucine taken.	Volume of wash water.	Alkaloid obtained (impure strychnine).	Alkaloid after re-precipitation still impure.
0·150	0·300	200 c.c.	0·300	0·180
0·150	0·250	200 „	0·300	0·178
0·150	0·200	200 „	0·243	0·171
0·150	0·150	200 „	0·216	0·171
0·075	0·150	200 „	0·087	—
0·075	0·125	200 „	0·086	—
0·075	0·100	200 „	0·087	—
0·075	0·075	200 „	0·089	—

The impure strychnine obtained in the first four experiments, and which evidently contained about 50 per cent. brucine, was dissolved in acid water, re-precipitated with ferrocyanide, the precipitate washed with 200 c.c. acid water, and the alkaloid extracted. These results indicate that at low temperatures the precaution of taking 5 c.c. liquid extract in place of 10 c.c. will not insure accurate results, even where 200 c.c. of wash water is used instead of 50 c.c. as recommended by Harvey.

Solubility of Strychnine Ferrocyanide in Acid Water.

Although, as previously shown, strychnine may be almost entirely removed from solution by potassium ferrocyanide, it is found by practical experience that no matter how long the washing with acid water be carried on the washings always possess a decidedly bitter taste, and that these washings do as a matter of fact contain strychnine may be proved by adding a little potassium ferrocyanide and shaking, when a very evident precipitation of strychnine ferrocyanide takes place on standing. Seeing that in an assay process in which decimal and centesimal parts of the preparation in question are taken, a very slight loss of strychnine must necessarily imply a considerable error by multiplication, it

was very important that the exact solubility of freshly-precipitated strychnine ferrocyanide at different temperatures should be ascertained. A solution of strychnine in acid water was precipitated with potassium ferrocyanide, the precipitate collected on a filter, washed with a little acid water, transferred to a stoppered flask and shaken for five minutes with water containing 2·5 per cent. dilute sulphuric acid at different temperatures, 100 c.c. of the solution filtered off, and the alkaloid determined. The results were as follows:—

Strychnine from 100 c.c. solution at			40° F. = 0·001
,,	,,	,,	50° F. = 0·0015
,,	,,	,,	60° F. = 0·0018
,,	,,	,,	70° F. = 0·0018
,,	,,	,,	80° F. = 0·002
,,	,,	,,	90° F. = 0·004
,,	,,	,,	100° F. = 0·004

The mother liquor from which the strychnine had been precipitated gave, at 48° F., 0·0015 gm. from 100 c.c.

Solubility of Brucine Ferrocyanide in Acid Water.

This was determined in the same way as that of strychnine ferrocyanide. The following results were obtained:—

Brucine from 100 c.c. solution at			40° F. = 0·018 gm.
,,	,,	,,	50° F. = 0·024 ,,
,,	,,	,,	60° F. = 0·031 ,,
,,	,,	,,	70° F. = 0·043 ,,
,,	,,	,,	80° F. = 0·049 ,,
,,	,,	,,	90° F. = 0·056 ,,
,,	,,	,,	100° F. = 0·075 ,,

The mother liquor from which the brucine had been precipitated gave, at 48° F., 0·008 gm. alkaloid from 100 c.c.

The results of the experiments on the solubility of strychnine ferrocyanide in acid water showed that when a large volume of the latter was used in washing the alkaloidal ferrocyanides thrown down in the official assay process, a very appreciable amount of strychnine would necessarily pass into solution. In fact, if the operation were conducted at the maximum summer temperature, a loss of 5, or even 10 per cent. of the total strychnine is quite conceivable. It occurred to us, that as strychnine is entirely removed from solution by potassium ferrocyanide, possibly the addition of the latter to the wash water employed would prevent

the solution of the precipitated strychnine. Some freshly precipitated ferrocyanide was accordingly thrown upon a filter and washed with acid water containing potassium ferrocyanide. 200 c.c. of this filtrate yielded less than 0·5 milligramme strychnine. When, however, freshly precipitated brucine ferrocyanide was similarly treated, its solubility was found to have been reduced in much greater proportion. 200 c.c. filtrate only gave three milligrammes brucine.

It was thus shown that the addition of potassium ferrocyanide to the wash water with a view of preventing the abstraction of strychnine from the precipitate was not feasible, seeing that the solution of the brucine would also be almost entirely prevented thereby.

Effect of Washing upon Mixed Strychnine and Brucine Ferrocyanides.

0·25 gm. strychnine and 0·5 gm. brucine were dissolved in water containing 2·5 per cent. diluted sulphuric acid, the solution precipitated with potassium ferrocyanide, the precipitate filtered off, and acid water at varying temperatures passed through as in the process of washing. 100 c.c. washings were collected at each stage of temperature, and the alkaloids determined in the usual way.

At	60° F.	100 c.c.	gave	0·024	gm. alkaloids.
„	70° F.	100 „	„	0·039	„ „
„	80° F.	100 „	„	0·045	„ „
„	90° F.	100 „	„	0·046	„ „
„	100° F.	100 „	„	0·052	„ „

Determination of Strychnine in Liquid Extract of Nux Vomica.

Six samples of liquid extract were obtained, and the strychnine determined by the official process. In order to vary the conditions somewhat, duplicate estimations of each sample were made with volumes of 5 c.c. and 10 c.c. respectively. The temperature at which these experiments were carried on ruled about 45° F. The quantity of wash water employed was varied, and when it became evident in washing the precipitates in the 10 c.c. series that an appreciable amount of strychnine was being lost, the alkaloids removed by the wash water were in the 5 c.c. series determined separately. All the results recorded in the paper were obtained by actual weighing: none by difference.

TABLE SHOWING RESULTS OF ANALYSIS OF SAMPLES OF LIQUID EXTRACT OF NUX VOMICA.

	No.	Alkaloid from ppt. impure strychnine.	Alkaloid from mother liquid.	Volume of wash water.	Alkaloid from wash water.			Strychnine in 100 c.c. liquid extract.
					Total.	Strychnine.	Brucine.	
Results from 10 c.c. of each liquid extract.	1	0·134	0·111	600 c.c.	0·069	—	—	1·34
	2	0·098	0·114	600 c.c.	0·055	—	—	0·98
	3	0·110	0·120	600 c.c.	0·067	—	—	1·10
	4	0·101	0·098	600 c.c.	0·053	—	—	1·01
	5	0·106	0·107	600 c.c.	0·058	—	—	1·06
	6	0·115	0·128	600 c.c.	0·044	—	—	1·15
Results when impure strychnine was dissolved, then re-precipitated, and strychnine recovered.	1	0·124	0·002	200 c.c.	0·005	—	—	1·24
	2	0·090	0·003	200 c.c.	0·002	—	—	0·90
	3	0·100	0·003	200 c.c.	0·005	—	—	1·00
	4	0·095	0·002	—	not detd.	—	—	0·95
	5	0·098	0·003	—	not detd.	—	—	0·98
	6	0·104	0·006	—	not detd.	—	—	1·04
Results from 5 c.c. of each liquid extract.	1		Stock	Exhausted.				
	2	0·048	0·071	300 c.c.	0·019	0·006	0·013	0·96
	3	0·052	0·056	300 c.c.	0·013	0·004	0·009	1·04
	4	0·052	0·071	300 c.c.	0·013	0·004	0·009	1·04
	5	0·057	0·069	300 c.c.	0·015	0·004	0·011	1·14
	6	0·058	0·057	300 c.c.	0·013	0·004	0·009	1·16

The following figures show the percentages, allowances being made for strychnine dissolved in the washing:—

	10 c.c. taken.	5 c.c. taken.
(1)	1·43	Stock exhausted.
(2)	1·07	1·08
(3)	1·19	1·12
(4)	1·10	1·12
(5)	1·15	1·22
(6)	1·24	1·24

Recapitulation, Practical Notes, and General Conclusions.

Strychnine is almost entirely precipitated by potassium ferrocyanide from a slightly acidified solution. Brucine is not thrown down so rapidly, and from dilute solutions is precipitated with difficulty unless the liquid is well stirred, when precipitation may be induced at low temperatures in a solution containing only 0·02 gm. alkaloid. Although strychnine is almost entirely removed from solution in water slightly acidified with sulphuric acid by potassium ferrocyanide, strychnine ferrocyanide is slightly soluble in water containing the same proportion of acid as the mother liquor from which precipitation has taken place. Brucine ferrocyanide is fairly soluble in water acidified with sulphuric acid and a dilute solution of the alkaloid in this liquid is with difficulty precipitated by potassium ferrocyanide. This is more particularly the case at high temperatures. When, however, precipitation has been induced in such a solution it will go on, especially at low temperatures, until almost all the alkaloid has been thrown down. The effect of stirring in promoting the precipitation of brucine is most remarkable. If a solution be made containing 0·06 gm. alkaloid in 200 c.c., potassium ferrocyanide added, and the mixture shaken, no precipitation takes place. If, however, the solution be well stirred a bulky precipitate is quickly produced. This has a practical bearing upon the pharmacopœial assay process—in working which it is important that stirring should be avoided, seeing that the removal of strychnine can be effected without it. When strychnine is precipitated by potassium ferrocyanide in the presence of brucine the precipitate always contains more or less of the latter, and if brucine be present in the solution in large proportion, the quantity of this alkaloid in the precipitate may even exceed the amount of the strychnine.

Strychnine containing a small proportion of brucine may be almost entirely freed from this alkaloid by re-precipitation. Should

the proportion of brucine to strychnine be large, it is necessary to wash well with acid water in order to get rid of it. This is effectual in removing everything except the last traces of the alkaloid. Strychnine ferrocyanide is almost insoluble at 40° F. in water containing 2·5 per cent. diluted sulphuric acid, but the solubility is increased fourfold at 100° F. Brucine ferrocyanide is fairly soluble in the same liquid, the solubility increasing at higher temperatures in the same ratio as that of strychnine ferrocyanide. If too large a volume either of the liquid extract or tincture be taken for assay, a considerable amount of brucine is liable to be precipitated. This is not, however, invariably the case.

It will be noticed from the table giving the results of the analyses of liquid extract of nux vomica, that the amount present in the first strychnine precipitate was sufficient to have thrown the strychnine results completely wrong unless the precaution had been taken to employ a volume of wash water amply sufficient to remove it. When 5 c.c. only of the liquid extract was taken the quantity of brucine removed was not more than would have been dissolved by 100 c.c. of wash water. We may say, however, that it is practically impossible to obtain pure strychnine by precipitation from a solution containing brucine. We have dissolved and reprecipitated some of our residues three or four times, but the alkaloid finally obtained, although, apparently, pure strychnine, has always given a distinct brucine reaction with nitric acid.

The practical results of our experiments, together with the observations made and the experience gained during the working of the same, justify the following conclusions and recommendations:—

(1) The assay process of the Pharmacopœia gives results which, though not absolutely accurate, are sufficiently so for all practical purposes.

(2) The volume of liquid taken should not exceed 5 c.c. liquid extract or 30 c.c. tincture.

(3) 200 c.c. wash water at a stated temperature, preferably 100° F., 38·0° C., should be employed, and a correction made for strychnine dissolved.

(4) In carrying out the process, the pharmacopœial instructions as to simple agitation without stirring, and as to the length of time allowed for precipitation of the strychnine, are to be strictly observed, as success depends altogether upon the conditions under which the process is carried out.

The PRESIDENT said the tendency of the paper seemed to be to

show that standardisation was only a step towards the ultimate use of the pure alkaloids themselves.

Mr. WIPPELL GADD said they were much indebted to the authors for this careful examination of a process which many had their doubts about. Did he understand them that if 200 c.c. of wash water at 38° F. were used they would get accurate results within very narrow limits, and that they had a figure which showed the average loss of strychnine? If so, they would be glad to have the figure.

Mr. BIRD thought this was one of the most valuable contributions to that meeting. This process had always been held in considerable doubt, and the discrepancies had never been satisfactorily cleared up until now. He had tested samples of the liquid extract, and had found great discrepancies. In one case the result was 1·5 when tested three or four months ago in the cold weather, and only 1·3 a few weeks ago, and he had been much exercised in his mind to account for it. In view of these researches, the whole thing was cleared up. Did Mr. Farr think six hours were absolutely necessary? He had tried experiments in which he had let the solution stand for a shorter period, and had not found much difference in the results; in one case two hours and six hours gave results practically identical. The recommendation to use water at 100° C. was quite novel, and overcame the difficulty admirably. The influence of temperatures must be new to many, and he did not know that it had occurred to any one before.

Mr. MOOR said he could corroborate Mr. Bird's statement that two hours gave about the same result as six. He congratulated the authors on pointing out the weakness of the B.P. process, whereby, through the absence of the most important detail, the amount of wash water, the process, which appeared to be an absolute one, might give almost any result. A public analyst might take a sample and get a result far below what it should be, and, there being no word of warning, he would probably take the case into Court.

Dr. ATTFIELD said that this excellent paper must not be simply regarded as offering an amended official process, nor must they consider there was any important absence of official detail with regard to the proportion of wash water; for full licence was given in the Preface to analysts to vary processes according to their own ideas of how the manipulation should be carried out. This was an important matter of principle, because a good deal had been said

about giving absolute details, as against giving that freedom to vary details which was alluded to on pages xiv. and xv. of the Preface to the Pharmacopœia. His view still was that pharmacists should be allowed, in consideration of their education, such licence as was already given to vary processes in connection with the assay of official preparations.

Mr. Moor thought if licence were given to vary processes, the term standard preparation was inapplicable. It might be varied out of all recognition, and one could vary the process altogether by adopting another one; the case of ipecacuanha being a good example.

Dr. Attfield said he agreed with all Mr. Moor had said; the processes might be varied altogether. The Pharmacopœia did not call them standard processes; it gave one way—which was generally the best one known at the date of publication—of getting at certain results. The Pharmacopœia laid down standard strengths, not standard processes. In the last Pharmacopœia manufacturers were not restricted to a particular process, and in this one analysts were not restricted to any particular process.

Mr. Moor said it would be very satisfactory if the process gave a certain result; the trouble was that it gave uncertain results.

Dr. Attfield said it was for the analyst to make investigation in such cases, just as Messrs. Farr and Wright had done.

Mr. Farr, in reply, said, with reference to the President's remarks as to standardised preparations giving place to purer alkaloids, he did not know that that would not be just as well, but there were a considerable number of prescribers who had a leaning towards natural compounds. The temperature they recommended was not 38° F., which was much too low, but 100° F., and the difference in solubility at different temperatures was very great and with 100 c.c. of wash water at 38° the yield of brucine would be about 18 millimetres, whilst at 100° it would be about 80. The accurate figures appeared in the tables. The difference in solubility of brucine at different temperatures fully explained all the peculiar results which had been obtained in the past. With regard to the time employed, and two hours being as good as six in many cases, that was so, but the behaviour of the precipitates was extremely peculiar; you might conduct a number of experiments with a similar solution, and one might come out almost immediately, whilst another would not commence to precipitate at all for half an hour. He should be afraid, therefore, to trust to two hours. In some cases it would be all right, but

in others he did not think the process would be concluded in that time. He certainly thought that a definite amount of wash water at a definite temperature should be used, and a correction made for the amount of strychnine dissolved in it. Seeing that ferrocyanide of strychnine was soluble in the acid water, a definite amount of that would remove a definite amount of precipitates within certain limits. The amount of semi-precipitate would vary at different times, and of course the filtration would proceed at different paces and result in different amounts being dissolved. In taking the solubility of the different ferrocyanides, he adopted the precaution of agitating the precipitate with acidulated water at the stated temperature for about five minutes, and then filtering. If it were done by merely pouring through filter paper, the rate of filtration would have important bearing on the result.

The authors were cordially thanked for their contribution.

The following three papers were read by Mr. C. T. Tyrer and discussed together.

DETERMINATION OF CORRECT MELTING POINTS, 2.[1]

By Thomas Tyrer and Albert Levy.

Our present paper is a continuation of that which we read before last year's Conference. We continued our investigations on "melting points" with the same five methods that were described last year, viz. :—

(1) B.P. method (B.P. 1898, p. 436).

(2) Graebe's method (*Ann. d. Chemie und d. Pharmacie*, 1887, 238, 320).

(3) Landolt's method (*Z. Phys. Ch.*, iv. 357, 1889).

(4) Piccard's method (*Ber.*, viii. 1875 p. 687).

(5) Löwe-Chrystomanos' (*Z. Analyt. Chemie*, xi. 211), (*Ber.*, xxiii. 1093).

The details of the above were described last year.

These methods were employed for the determination of the melting points of salicylic acid, carbolic acid, and the phenyl ester of salicylic acid salol. In each case the ordinary commercial, dried, and purified substances were determined.

Regarding our results for salicylic acid, it will be noticed that only the commercial acid stands the B.P. test, whilst the dried

[1] The blocks used to illustrate this paper were kindly supplied by Messrs. Thomas Tyrer & Co., Limited.

and purified acid agrees with the melting point required by the Dutch, Japanese and Hungarian Pharmacopœia.

Dunstan, Bloch, and Chartier give the melting points for salicylic acid in the *Pharmaceutical Journal* [3], xxi. 429–437. They state the highest melting point was 159° and the lowest 155°. Bernthsen states 158°, Remsen, 155–156°, Richter, 155–156°. Fischer (*Lehrbuch d. Chemie f. Pharm.*) states that salicylic acid melts at about 160°; Roscoe and Schörlemmer 155–156°; Reissert (*Ber.*, 23, 2242) gives 159·05°. Only recrystallised and purified salol gives the melting point required by the B.P., whilst the commercial and dried salol show lower melting points.

With regard to carbolic acid, the melting points of commercial samples show considerable differences when compared with dried or purified samples; only the purified samples stand the test required by the Pharmacopœia. The melting point of pure synthetically prepared (from benzol-sulphonic acid) carbolic acid is between 42·5° to 43°, whilst an acid prepared from aniline by the diazo reaction melts between 41° and 42°; with carbolic acid purified by repeated distillation until two following fractions showed the same melting point, we could not get a higher melting point than 40°. This low melting point might be due to the presence of traces of creosolic acid, as small quantities of the latter lower the melting point of carbolic acid very considerably, as was observed by Lunge.

In a paper read before the Pharmaceutical Conference of the Philadelphia College of Pharmacy, November 17, 1891, and published in the *American Journal of Pharmacy*, on synthetical carbolic acid, it was stated that 40° acid was at present a commercial article sold at excessively low prices, and if a small part of the attention and labour which is used in producing a synthetical acid was expended in the further purification of this 40° acid, without doubt a just as good, if not a purer, article could be produced direct from tar oils and at very much lower cost.

We have continued the determination of melting points on menthol and thymol, substituting other methods for the ones we have hitherto worked upon, and compared them with the Pharmacopœia method.

"Mills' method" (Fig. I.) (*Proc. Roy. Soc.*, xxxiii. p. 204).—In a bath nearly filled with oil of vitriol, a glass funnel is inserted, having on its lower edge six equidistant semi-circular openings of about 5 mm. radius, and at the end of the neck four

of the same; a thin test tube resting freely on the funnel contains a bath of paraffin oil, in which the thermometer bulb is centrally placed. Against the bulb, in a little tube, is placed the

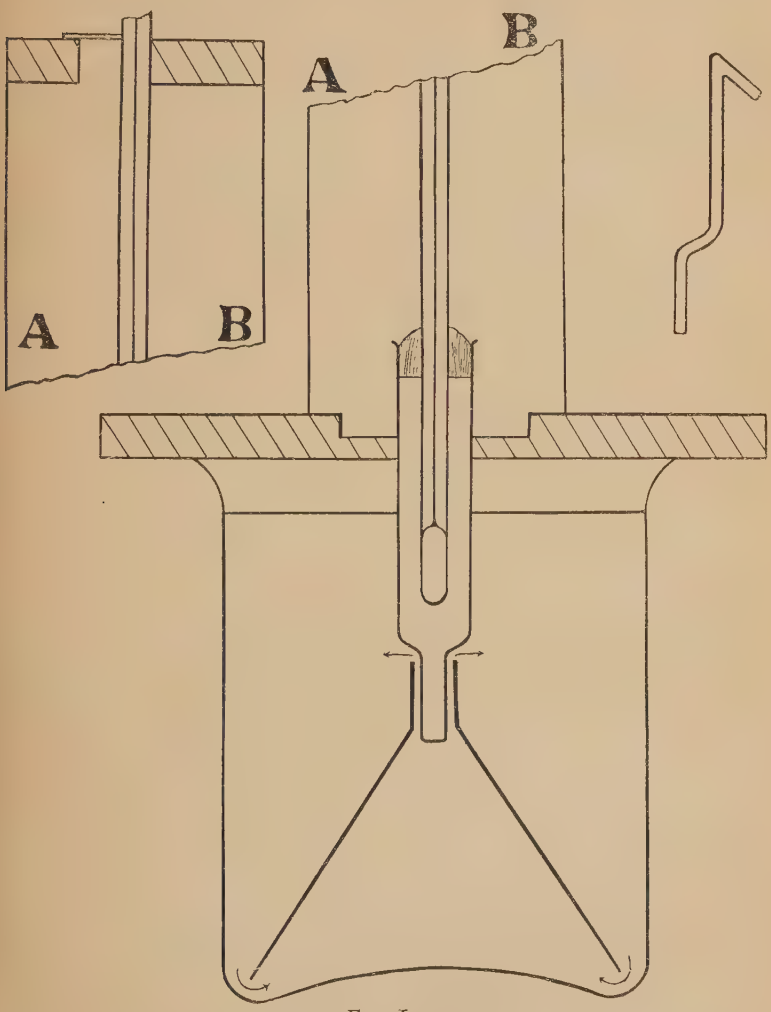


FIG. I.

substance, the melting point of which is to be determined. When the large bath is heated regular convection takes place in the liquid; the effect upon the thermometer is such as to cause the

mercury to rise with very great steadiness. This method gives good results.

The method of Kuhara and Chikashigé (Fig. II.) (*Chem. News*, vol. lxxx. No. 2089).—Instead of a capillary tube, halved microscopic cover-glasses are used, between which the substance to be tested is introduced either in powder, crystals or thin slices. If the substance is in a state of powder, the layer can be made very thin by pressing and sliding the two pieces together, so that the heat of the bath may at once be conducted throughout the whole mass. The surface exposed is very large compared with the quantity of the substance taken, and consequently its behaviour towards heat may be distinctly observed. Before the substance is melted the glass appears opaque, whilst it becomes transparent when fusion occurs; the thinner the layer the more distinct is the point of demarcation.

The pair of glasses is attached to a holder made of platinum foil, and fastened, if necessary, with fine wire. This arrangement is suspended in a wide test tube, in which a thermometer is inserted close to the holder; the test tube, serving as an air bath is immersed well into a sulphuric acid bath. The further steps of the process require no modification of the old methods. This method gives good results, as it indicates exactly the commencement of liquefaction, and it also obviates the difficulty of filling a capillary tube.

Vandevyver's method (Fig. III.) (*Ann. Chim. Anal. Appl.*, 1898, xiii. 397-399), (*Chem. Centr.*, 1899, i. [4], 241-242).—In this apparatus a wire rod is provided with a mirror, M, fixed at an angle of 135°, and two rings, one C, which is fixed, and the other D, which is movable, and has an overlapping rim. Filter-paper is clamped between the two rings, and a piece of the substance to be examined is placed on the paper; the rod is then fixed in a test-tube by means of a cork, which also supports a sensitive thermometer, T, so arranged that the bulb is close to the substance to be examined. The whole is then placed in a glass vessel, V, containing water, glycerin, and paraffin. R is a stirrer, which is provided with a brush, S, in order to remove air bubbles from the sides of the vessel. The apparatus is slowly and carefully heated, and the melting point determined by observing the reflection in the mirror of the stain produced on the paper by the substance on melting. If the substance produces a stain at the ordinary temperature on the paper the latter is replaced by a dull glass disc. Substances which melt near the ordinary temperature are sub-

jected to a preliminary cooling. With substances of very high melting point a metallic mirror is employed in place of the ordinary glass one.

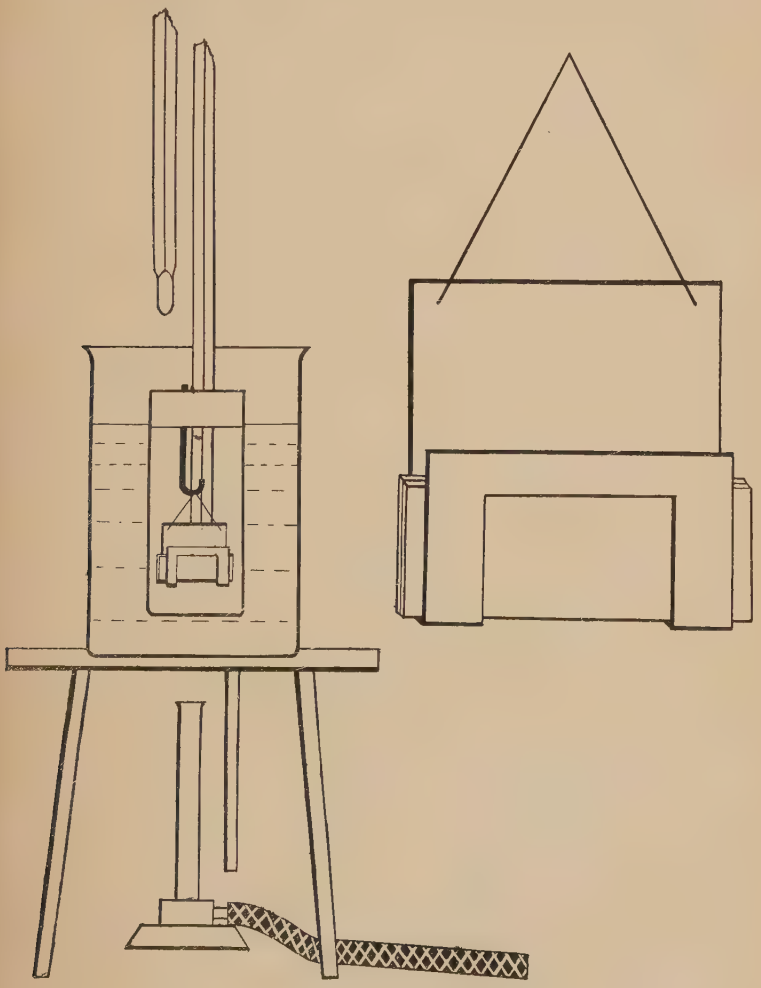


Fig. II.

We found during our experiments that it was necessary to have the bulb of the thermometer well to the interior of the rings, and

also to employ a very thin absorbent paper, such as that used for copying-paper, and termed "patent stout buff."

"Levy's Acoustical Method" (Fig. IV.).—The objections against the electrical methods were first pointed out by Landolt (*Z. Phys. Ch.*, iv. 357). This author used Löwe's modification (*Z. Analyt. Ch.*, xi. 211) of Chrystomanos' method (*Ber.*, xxiii. 1093), and states that the loosening of the substance from the wire may cause considerable delay whilst the temperature of the thermometer rises.

Reissert (*Ber.*, xxiii. 2, 2240) stated in a paper on melting points that the point of the beginning of melting should always be taken, because this point is nearest the melting temperature. For this reason all methods in which the point of complete liquefaction is observed, as is the case with melting point methods, where an electric alarm is used, are to be rejected as inaccurate. Such determinations give rise to high values, and the value is the higher the quicker the apparatus is heated. We have previously dealt with an electrical method, which, as we observed, gave high results, although apparent contact was made, yet the bell did not ring. This may be brought about by the difficulty which an ordinary electric current has, in subduing this comparatively big resistance, which exists between the two poles, and which resistance may with some substances be enlarged by a secondary current formed by electrolysis of the substance under examination. We used, in order to prevent this possible fault, an alternating current, and, as an indicator of contact, a telephone. To remove the faults which were pointed out by Reissert, and such as were pointed out by A. Ferreil (*Bull. Soc. Chem.*, 1890, iii. 195 to 200), who found that on reheating the resolidified substances higher results were found than by directly heating the substance, we used the following method of filling the tube:—The end of the glass tube which lodged into the mercury had an internal diameter of about 4 mm. In the end of this a small quantity of the powdered substance was pressed by means of a metal rod of about $3\frac{1}{2}$ mm. diameter; the height of the substance was, after pressing, about 1·5 mm. Over this substance pure mercury was poured to the height of about 20 to 30 mm. (The difficulty which is caused by some substances, which cannot stand the weight of the mercury, can be removed by fixing the small tube in the melting point apparatus and then adding the mercury; the weight is then partly carried by the mercury in the apparatus.) The apparatus consists of a small battery, a Ruhmkorff's coil, Chrysto-

manos' melting beaker (*Ber.*, xxxiii. 1093) (instead of which an ordinary beaker may be used) and a telephone. The substance is heated in the mercury bath, and, having a large surface, is uniformly heated. Should the substance liquefy in the centre first

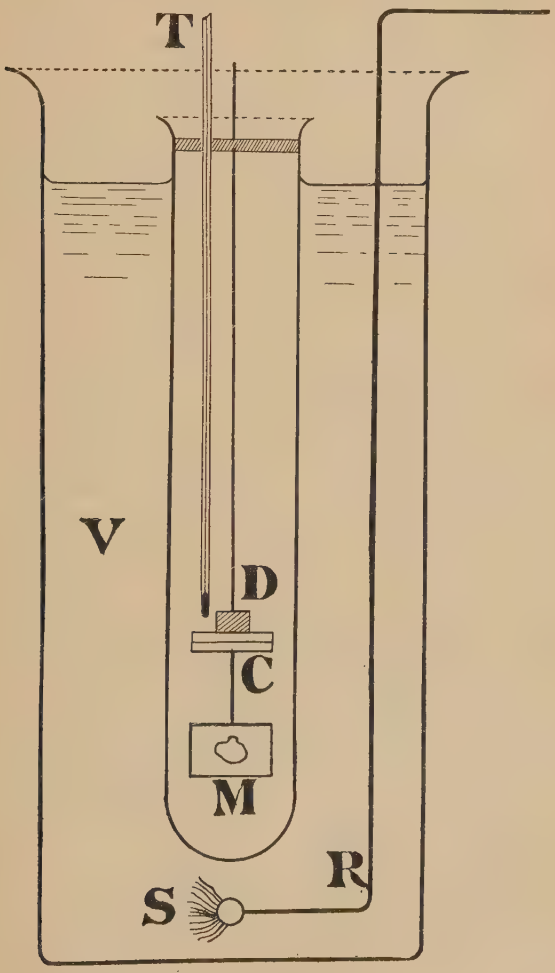


Fig. III.

contact is easily made with the mercury, and if the substance which is nearest the walls of the glass tube becomes liquid first the weight of the mercury is sufficient to subdue any adhesion of

capillary attraction and to make immediate contact (the melting point is also indicated by the falling of the mercury). As soon as contact is made the noise of the commutator can be distinctly noticed by the loud sound in the telephone.

Our results show satisfactory results with this apparatus for the substances hitherto examined, as well as for substances melting over 100°.

Regarding our results on menthol, we found that only dried and purified menthol agrees with the requirements of the B.P. Schimmel & Co. reported (October, 1898) that the menthol recognised in the B.P. may not be pure, since it is stated that crystals are usually more or less moist from adherent oil. The requirements of the German Pharmacopœia, however, are more stringent, and can only be met by a pure article having brittle crystals and a melting point of 43°. The wide limits of the B.P. for thymol make the melting points for commercial, dried, and purified products agree.

In Schimmel's report (October, 1898) the range of melting points from 43·3° to 51°, adopted by the B.P., is considered too wide, since pure thymol should not melt at a lower temperature than 51°. We only found 50·07° for purified samples. Reissert states (*Ber.*, xxiii. 2242) that thymol purified by distillation melts in a capillary tube (1·5 mm. diam.) at 49·40°; when the thermometer was put into the substance it melted at 49·65° and solidified at 49·10°.

Before answering the question as to which of all known methods of taking melting points is the best and most practicable, it must first be decided as to which of the following temperatures should be regarded as the true melting point:—

1. The temperature at which liquefaction commences, which is usually considered as the melting point on the Continent.

2. The temperature when the whole of the substance is in a liquid state.

3. The temperature which is adopted by the B.P.—namely, that temperature when the resolidified substance becomes liquid again.

4. The temperature of resolidification.

Some of the apparatus, of which at least twenty are published, are employed for one or the other of these three temperatures.

Some of these methods are very ingenious, and we trust to continue this investigation on pharmaceutical melting points in a future paper, repeating our previous methods in comparison with

a number of fresh methods, some of which have points which recommend their consideration.

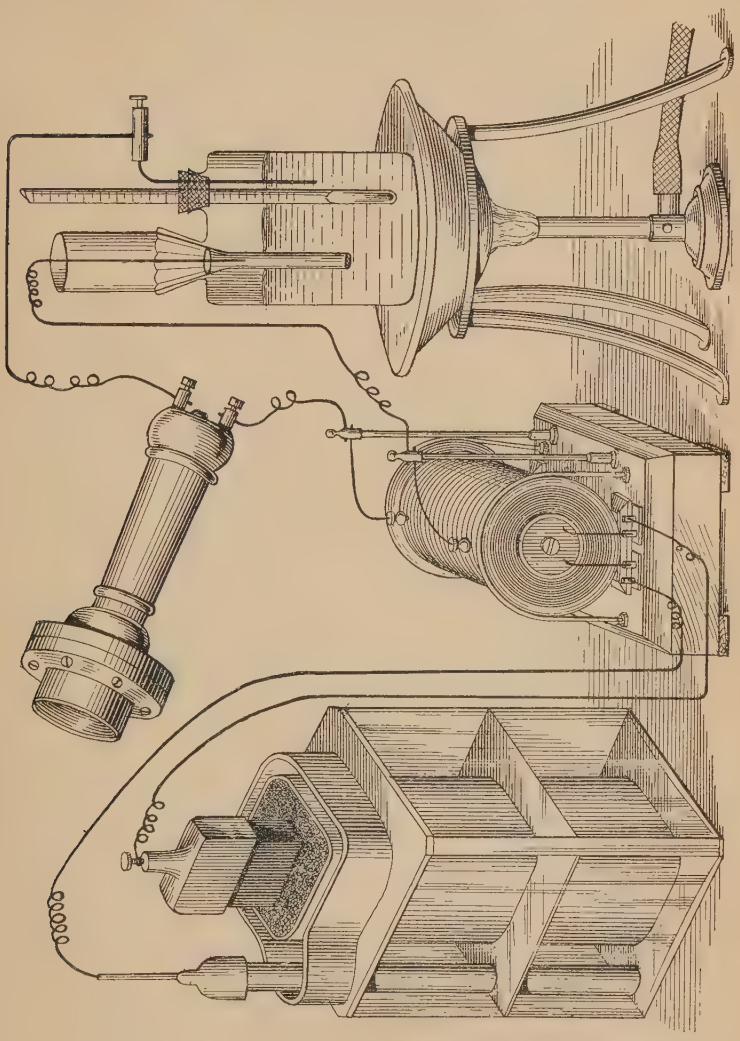


Fig. IV.

It is obvious that no single method is applicable to all pharmaceutical substances; it will, therefore, be our aim to determine which methods are most applicable to the various substances.

Comparison of Methods.

The object of the present supplementary work was to determine over what range of temperature various methods of determining melting points are available, and which are best.

With this object we examined the following substances of different characteristics, the melting points of which cover a wide range of temperature, viz.:—about 45°, 120°, 200°.

(1) A substance having the character of a fat: spermaceti (cetaceum).

(2) A substance showing no extraordinary physical peculiarity: beta naphthol.

(3) Picrotoxin: a vegetable body of uncertain constitution, belonging probably to the glucosides.

In order to insure that moisture should not affect the melting points, the substances were previously dried. The methods were those dealt with in our previous papers, viz.:—The P.B. method, Graebe's, Mill's, Landolt's, Kuhara and Chikashige's, Vandevyver's, Piccard's Löwe-Chrystomanos', and Levy's acoustical method. The table shows the results in comparison. We have also compiled a table giving the melting points of these substances as stated by various pharmacopœias. With regard to cetaceum, it will be noted that the P.B. method gives results which are high compared with those of other methods, whilst Graebe's, Mill's, Landolt's, Kuhara's, Vandevyver's, and Levy's, practically agree. Piccard's, and Löwe-Chrystomanos' agree with the P.B. method, as in these three the substance has to be liquid before the apparatus can be charged. With Vandevyver's method it was necessary to replace the absorbent paper by a dull glass disc. The method, however, is not especially applicable to fatty bodies, as they generally contain moisture, and this alone produces a stain.

A great deal has been done in devising methods for determining the melting points of fats, and we have therefore not especially described such. The following references to such methods may be found useful:—

Roster. *Ber.*, xii. 1926b, 1879.

Cross and Bevan. *J.C.S.*, vol. xli., Trans. 111.

B. C. Dannien. *Compt. Rend. de l'Académie des Sciences*, 1159, 166.

R. Zalorski. *Chem. Ztg.*, xii. 788.

R. Ebert. *Chem. Ztg.*, xv. 76.

A. Ferriel. *Bull. Soc.*, xxxi. 1879; and *Bull. Soc.*, 1890, 3, 195–200.

Le Sueur and Crossley. *J.C.S.I.*, 1898, 988–989.

The special method for estimating fatty substances in the new German Pharmacopœia, 1900, is noticeable. A thin-walled capillary tube, open at both ends, of a maximum 1 mm. in diameter, is filled to 1 cm. with a clear molten fat by suction, the tube is allowed to remain for 24 hours at 10° C. in order to solidify the fat completely, then the tube is attached to a thermometer and brought into a test tube of 30 mm. diameter, filled with water. The temperature should be gradually raised whilst frequently stirring. The temperature at which the fat column becomes transparent and goes quickly to the surface is to be considered as the melting point.

With regard to beta naphtol.—The P.B. and Löwe's and Chrystomanos' method agree, but are high compared with the others. Piccard's and Vendevyver's also agree, but are higher than Graebe's, Mill's, Landolt's, Kuhara and Chikashige's, and Levy's, which all agree.

Picrotoxin shows a peculiarity which might cause erroneous results when applying Löwe-Chrystomanos' and Piccard's methods. The substance becomes liquid at about 100 and again becomes solid at a higher temperature. The tubes must be filled with the substance without remelting. The P.B. method gives 196·5, whilst the other methods show higher results. The differences may possibly be due to additional corrections of the emergent column of the thermometer. For high temperatures it may possibly be more accurate to use an apparatus which does not require a correction for emergent column, such as the apparatus devised by Roth (*Ber.*, 1886, 2, 1970), and modified by Hurter (*Chem. Ztg.*, July, 1900), wherein the thermometer is surrounded entirely by hot sulphuric acid.

From the results of considerable work with the foregoing methods, we conclude that the most convenient form of apparatus for general work, as applied to a majority of pharmaceutical substances, is Graebe's, which is a modification of the apparatus of Auschutz and Schulz (*Ber.*, x., 1877, 1800–1801) whilst electrical methods which eliminate to some extent the error of individual observation are to be recommended.

Melting Points given by Various Pharmacopœias.

	Salicylic Acid.	Carbolic Acid.	Salol.	Menthol.	Thymol.
Pharmacopœa Austrica, Viennæ, 1889	...	37–70°	...	cca. 42°	...
Pharm. Belgica I., Bruxelles, 1885 .	158°	41°	...	...	...
B.P., 1898	156–157°	38·8°	42–43°	42–43°	43·3–51·7°
Farmacopea Chilena, Leipzig, 1886 .	158°	35°	...	...	...
Pharm. Danica, Kopenhagen, 1893 .	cca. 156°	not under 38°	cca. 42°	cca. 43°	51–52°
Pharm. Nederlandica, III., S. Gravenhage, 1889 . .	cca. 160°	39–42°	...	...	cca 50°
Codex Medicamentarius, Paris, 1884	158°	42°	...	...	44°
Pharm. Germanica, III., Berlin, 1895 .	cca. 157°	40–42°	cca. 42°	43°	50–51°
Pharm. Hungarica, II., Budapest, 1888	cca. 160°	35–44°	...	...	44°
Farmacopeo ufficiale del Regno d'Italia, Roma, 1892	cca. 157°	cca. 40°	42–43°	42–43°	50–51°
Pharm. Japonica, Tokyo, 1891 . .	cca. 160°	cca. 38°	...	cca. 43°	cca. 50°
Nueva Farmacopea Mexicana, III., Mexico, 1896 . .	200°	40°	42°	30·5–36·5°	...
Pharm. Norvegica, Kristiania, 1895 .	cca. 156°	cca. 40°	cca. 42°	cca. 43°	51–52°
Pharmacopèa Portugueza, Lisboa, 1876	158°	35°	...	not stated.	...
Rossieskaia Pharm., IV., St. Petersburg, 1891 . . .	157°	40–42°	42°	43°	50°
Farmacopea Oficial Espanola, VI., Madrid, 1884 . . .	156°	35°	...	...	44°
Pharm. Svecica, VII., Stockholm, 1888	not stated.	ord. 37–40° pur. 40°	...	...	...
Pharm. Helvetica, III., Zurich, 1893	156°	42°	42–43°	cca. 43°	50–51°
U.S.P., VII., 90, Philadelphia, 1894	156–157°	not under 35°	42–43°	43°	50–51°
Farmacopea Venezolana, 1898. Caracas. . . .	not stated	33°	not stated	43°	50°

SUMMARY.

Salicylic Acid.

Pharmacopœial Melting Points.—Belgian, 158°; British, 156–157°; Chilian, 158°; Danish, cca. 156°; Dutch, cca. 160°; French, 158°; German, cca. 157°; Hungarian, cca. 160°; Italian, cca. 157°; Japanese, cca. 160°; Mexican, 200°; Norwegian, cca. 156°; Portuguese, 158°; Russian, 157°; Spanish, 156° Swiss, 156°; United States, 156–157°.

M.P. of Commercial.—By B.P. method, 157·90°; G[raebe's], 156·72°; L[andolt's], 157·09°; P[iccard's], 157·77°; E[lectric], 157·74°. Average of all, 157·44°.

M.P. of Dried.—B.P., 159·61°; G., 158·66°; L., 158·99; P., 158·39°; E., 159·22°. Average of all, 158·97°.

M.P. of Purified.—B.P., 160·03°; G., 159·52°; L., 159·63°; P., 159·96°; E., 159·61°. Average of all, 159·75°.

Salol.

Pharmacopœial Melting Points.—British, 42–43°; Danish, cca. 42°; German, 42°; Italian, 42–43°; Mexican, 42°; Norwegian, cca. 42°; Russian, 42°; Swiss, 42–43°; United States, 42–43°. Not in others.

M.P. of Commercial.—B.P., 41·48°; G., 40·96°; L., 41·09°; P., 41·86°; E., 41·69°; Average of all, 41·42°.

M.P. of Dried.—B.P., 41·68°; G., 41·09°; L., 41·18°; P., 42·08°; E., 41·88°; Average of all, 41·58°.

M.P. of Purified.—B.P., 42·89°; G., 42·02°; L., 42·11°; P., 42·64°; E., 42·98°. Average of all, 42·52°.

Carbolic Acid.

Pharmacopœial Melting Points.—Austrian, 37–40°; Belgian, 41°; British, 38·8°; Chilian, 35°; Danish, not under 38°; Dutch, 39–42°; French, 42°; German, 40–42°; Hungarian, 35–44°; Italian, cca. 40°; Japanese, 38°; Mexican, 40°; Norwegian, cca. 40°; Portuguese, 35°; Russian, 40–42°; Spanish, 35°; Swedish, ord., 37–40°, pur., 40°; Swiss, 42°; United States, not under 35°; Venezuelean, 33°.

M.P. of Commercial.—B.P., 37·32°; G., 36·25°; L., 36·29°; P., 37·24°; E., 37·53°. Average of all, 36·93°.

M.P. of Dried.—B.P., 40·43°; G., 39·39°; L., 39·47°; P., 40·97°; E., 40·88°. Average of all, 40·22°.

M.P. of Purified.—B.P., 40·71°; G., 40·02°; L., 40·05°; P., 40·60°; E., 40·87°. Average of all, 40·45°.

Menthol.

Pharmacopœial Melting Points.—Austrian, cca. 42°; British, 42–43°; Danish, cca. 43°; German, 43°; Italian, 42–43°; Japanese, cca. 43°; Mexican, 30·5–36·5°; Norwegian, cca. 43°; Russian, 43°; Swiss, cca. 43°; United States, 43°; Venezuelean, 43°. Not in others.

M.P. of Commercial.—By B.P. method, 40·28°; M[ills], 38·64°; K[uhara and Chikaschigé], 38·66°; V[andevyver], 39·04°; A[coustical], 38·75°. Average of all, 39·07°.

M.P. of Dried.—B.P., 42·64°; M., 40·91°; K., 41·56°; V., 42·02°; A., 40·94°. Average of all, 41·61°.

M.P. of Purified.—B.P., 43·03°; M., 42·80°; K., 42·90°; V., 42·54°; A., 42·88°. Average of all, 42·83°.

Thymol.

Pharmacopœial Melting Points.—British, 43·3–51·7°; Danish, 51–52°; Dutch, cca. 50°; French, 44°; German, 50–51°; Hungarian, 44°; Italian, 50–51°; Japanese, cca. 50°; Norwegian, 51–52°; Russian, 50°; Spanish, 44°; Swiss, 50–51°; United States, 50–51°; Venezuelean, 50°. Not in others.

M.P. of Commercial.—B.P., 47·09°; M., 45·79°; K., 45·86°; V., 46·29°; A., 46·05°. Average of all, 46·21°.

M.P. of Dried.—B.P., 48·84°; M., 47·04°; K., 47·03°; V., 46·86°; A., 46·38°. Average of all, 47·23°.

M.P. of Purified.—B.P., 50·30°; M., 50·09°; K., 50·28°; V., 49·58°; A., 50·11°. Average of all, 50·07°.

For the sake of convenience we add two tables for the rapid calculation of the exposed column of the thermometer; the first was prepared according to the B.P. formula (*B.P.* 98, p. 436), while the second one was prepared by experiments which were carried out by Prof. E. Rimbach (*Ber.*, 1889, 2, p. 3074).

We also add a list of pharmacopœial melting points of the substances which were examined last year, and the complete publication of which list was accidentally omitted.

Table for the Rapid Calculation for the Exposed Column.

Corrected Temperature=T+000143 (T-t) N.

T=observed temperature.

a=0·000143=difference between the co-efficient of cubic expansion of quicksilver and glass.

N=length of the emergent column.

t′=mean temperature of the emergent column.

T-t′.	30	35	40	45	50	55	60	65	70	75	80	85	=T-t′.
10	0·04	0·05	0·06	0·06	0·07	0·08	0·09	0·09	0·10	0·11	0·11	0·12	10=N
20	0·09	0·10	0·11	0·13	0·14	0·16	0·17	0·19	0·20	0·21	0·23	0·24	20
30	0·13	0·15	0·17	0·19	0·21	0·24	0·26	0·29	0·30	0·32	0·34	0·36	30
40	0·17	0·20	0·23	0·26	0·29	0·31	0·34	0·37	0·40	0·43	0·46	0·49	40
50	0·21	0·25	0·29	0·32	0·36	0·39	0·43	0·46	0·50	0·54	0·57	0·61	50
60	0·26	0·30	0·34	0·39	0·43	0·47	0·51	0·56	0·60	0·64	0·69	0·73	60
70	0·30	0·35	0·40	0·45	0·50	0·55	0·60	0·65	0·70	0·75	0·80	0·85	70
80	0·34	0·40	0·46	0·51	0·57	0·63	0·69	0·74	0·80	0·86	0·92	0·97	80
90	0·39	0·45	0·51	0·58	0·64	0·71	0·77	0·84	0·90	0·97	1·03	1·09	90
100	0·43	0·50	0·57	0·64	0·72	0·79	0·86	0·93	1·00	1·07	1·14	1·22	100

Correction for the exposed column according to E. Rimbach's Table III., *Ber. D.D. Chem. Ges.*, 1889, 2, p. 3074.

0—100° divided in 0·1° 4 min. length of a degree.

T-t′=	30	35	40	45	50	55	60	65	70	75	80	85	=T-t′.
10	0·04	0·04	0·05	0·05	0·05	0·06	0·06	0·07	0·08	0·09	0·10	0·10	10=N
20	0·12	0·12	0·13	0·14	0·15	0·16	0·17	0·18	0·19	0·20	0·22	0·23	20
30	0·21	0·22	0·23	0·24	0·25	0·25	0·27	0·29	0·31	0·33	0·35	0·37	30
40	0·28	0·29	0·31	0·33	0·35	0·37	0·39	0·41	0·43	0·45	0·48	0·51	40
50	0·36	0·38	0·40	0·42	0·44	0·46	0·48	0·50	0·53	0·57	0·61	0·65	50
60	0·45	0·48	0·51	0·53	0·55	0·57	0·60	0·63	0·66	0·69	0·73	0·78	60
70						0·66	0·69	0·71	0·75	0·81	0·87	0·92	70
80							0·76	0·81	0·87	0·93	1·00	1·06	80
90								0·92	0·99	1·06	1·13	1·20	90
100									1·10	1·18	1·26	1·34	100

Melting Points given by Various Pharmacopœias.

	Acetanilid.	Phenacetin.	Sulphonal.	Phenazone.
Austrian	cca. 112	—	—	111–113
British	113·5	135	125·5	113
Danish	113	—	125–126	cca. 113
Dutch	cca. 120	—	—	cca. 110
German	113	135	125–126	113
Hungarian	112	—	—	Not under 110
Italian	112–113	—	—	cca. 113
Japanese	113	—	—	110
Mexican	113	132·5–134	—	110–113
Norwegian	cca. 114	—	125–126	110–113
Russian	114	134·5	125·5	112
Swiss	112–113	135	126	cca. 112
U.S.A	113	—	—	—

TURPENTINE OIL AND TEREBENE.

By Chas. T. Tyrer and Alfred Wertheimer.

Professor Armstrong (*S.C.I.*, 1882, 480), in a paper on turpentine, says:—"I may add that certain observations even lead me to think it not unlikely that the low dextro-rotatory power of American turpentine is due to the presence of a lævo-rotatory terpene. This would serve to explain the difference in optical character of products from various localities."

Ough (*B.P.C.*, 1899) notes that a sample of terebene is peculiar, "for, as previously stated, the makers of this specimen informed me it was made from American turpentine; therefore, I am quite at a loss to understand why it should have a lævogyrate action on polarised light."

In reviewing the literature we notice several such remarks, but we are unable to find any record of proof, or, indeed, thorough physical examination of turpentine or terebene. We have made the following experiments with a view to fill up the gap in some measure. To insure good results we started with a fairly large quantity—62 lbs. of American turpentine of specific gravity 0·871 and optical rotation + 6·2. This was subjected to careful fractional distillation into 21 fractions. The percentage, optical rotation, specific gravity, and refractive index of each fraction was observed, the results being noted in the following table:—

Table 1.

Fraction.	Per cent.	Sp. G.	α	N.
97–158 . . .	4	0·8724	+ 10·7	1·46455
158–158·5 . .	17·4	0·8722	+ 9·3	364
158·5–159 . .	14·5	0·8721	+ 9·6	364
159–159·5 . .	17·3	0·8725	+ 7·6	405
159·5–160 . .	10·5	0·8641	+ 6·4	682
160–160·5 . .	11	0·8712	+ 4 8	721
160·5–161 . .	5·25	0·8785	+ 3·6	752
161–162 . . .	6	0·8698	+ 3 7	761
162–162·5 . .	2·8	0·8795	+ 1	761
162·5–163 . .	1·7	0·8710	— 0·8	781
163–163·5 . .	0·9	0·8680	— 1·3	841
163·5–164 . .	1·2	0·8731	— 2·2	860
164–164·5 . .	0·6	0·8751	— 2·7	1·47086
164·5–165 . .	0·5	0·8748	— 3·6	341
165–165·5 . .	1	0·8727	— 4·8	1·46481
165·5–168 . .	0·7	0·8744	— 5·1	949
168–175 . . .	1·4	0·8737	— 7·5	1·47057
175–180 . . .	0·2	0·8824	— 10	223
180–185 . . .	0·15	0·8876	— 10·2	233
185–190 . . .	0.175	0·8949	— 10·3	145
Residue . . .	1·3	0·9133	Coloured.	—

NOTE.—In this and the subsequent tables, α stands for the observed rotation for yellow light taken in a tube 188·6 mm. long, as this length tube is usually found in pharmaceutical laboratories. Comparatively they are correct, but α_D may be found by the formula $\alpha_D = \frac{\alpha.}{1d.}$ The temperature is all through 15° C. N. stands for the refractive index for a sodium flame, taken at 20° C.

It will be noted that we obtained nine dextro-rotatory and eleven lævo-rotatory fractions, proving the correctness of Professor Armstrong's surmise, and that the presence of a lævo- and dextro-rotatory terpene in a dextro-rotatory bulk does not necessarily infer an admixture of French and English turpentine oils, as has been stated. The specific gravity increases with decreasing dextro- and increasing lævo-rotation, as does the refractive index.

In order to ascertain which of the fractions, if any or all, would yield an optically inactive product on treatment with sulphuric acid, we distilled 50 lbs. of the American turpentine (from the same bulk as the first experiment) and fractionally distilled to fourteen fractions, the percentage, optical rotation, specific gravity and refractive index being noted. An equal portion of each of the first eleven fractions was taken and treated with the same amount of sulphuric acid under conditions of time, temperature and addition, as identical as possible. Each fraction so acted upon was distilled in a current of steam, and its optical rotation, refractive index, and specific gravity noted. The results are shown in the following table:—

TABLE 2.

	Oil of Turpentine.				Terebene.		
Fraction.	P. cent.	Sp. G.	α	N.	Sp. G.	α	N.
97–158	1·0	0·8730	+ 11·6	1·46247	0·8813	+ 13·2	1·46365
158–160	13·6	0·8725	+ 10·3	0·405	0·8997	+ 9·5	1·45579
160–160·1 a.	12 5	0·8724	+ 9·2	0·445	0·9025	+ 7·9	1·46949
160·1–160·5	11·56	0·8700	+ 8·5	0·464	0·8743	+ 6·7	553
160·5–161	15·25	0·8710	+ 8·3	0·435	0·8753	+ 3·8	722
161–162 b.	17·9	0·8722	+ 7·0	0·445	0·9092	+ 5·3	1·47125
162	4·25	0·8717	+ 5·3	0·553	0·8759	+ 5·3	1·46524
162–163 c.	3·56	0·8717	+ 3·6	0·659	0·8735	+ 1·6	405
163–164·5	4·75	0·8748	+ 2·5	0·679	0·8758	— 0·4	821
164·5–168 d.	4·0	0·8814	0·0	0·689	0·9046	— 2·1	831
168–172	1·1	0·9014	— 0·3	1·47155	0·8979	— 3·7	1·47076
172–175	0·375	0·8903	— 0·7	0·038			
175–187	0·7	0·8965	— 6·1	0·145			
Residues . .	2·4	0·9023		0·732			

It will be noted that the decrease in rotation would be proportional to that of the original turpentine fractions if the conditions had been *absolutely* identical. In the fraction boiling 164·5–168°, which happened to be optically inactive, the action of sulphuric acid caused a lævo-rotation of – 2·1, pointing to the probability of this inactive portion being a mixture, or of its undergoing polymerisation. With the view of ascertaining whether there existed, as stated by several authors, any considerable proportion of turpentine optically inactive and of definite boiling point, we refractionated the following fractions—viz., that boiling

(*a*) 160, 160·1 + 9·2
(*b*) 161, 162 + 7
(*c*) 162, 163 + 3·6
(*d*) 164·5, 168 + 0

with the following results:—

TABLES 3.

(A.)

Fractions.	Sp. G.	*a*	N.
62–158	0·8671	+ 13·4	1·46216
158	0·8634	+ 12	227
158	0·8657	+ 11·9	216
158–158·3	0·8684	+ 11·3	336
158·3–159	0·8687	+ 10·3	405
159–159·5	0·8700	+ 8·8	405
159·5–161	0·8698	+ 6·6	553
161–162	0·8792	+ 4	573
Residue	0·9077	– 3·7	1·47673

(B.)

Fractions.	Sp. G.	*a*	N.
157	0·8645	+ 10·6	1·46326
157	0·8667	+ 10	365
157	0·8674	+ 9·8	454
157–157·5	0·8682	+ 9·3	405
157·5–158	0·8660	+ 8·5	405
158–158·5	0·8650	+ 7·9	534
158·5–159	0·8741	+ 7·1	504
159–159·5	0·8692	+ 6·1	544
159·5–160	0·8750	+ 4·8	553
160–161	0·8698	+ 2·7	652
161–169	0·8763	– 2	1·47586
Residue	0·9397	Coloured	1·49165

(C.)

Fractions.	Sp. G.	α	N.
50–153	0·8640	+ 8·2	1·46365
153–160	0·8667	+ 6·8	464
160	0·8676	+ 6·4	51
160–160·7 . . .	0·8716	+ 4·4	—
160·7–161·3 . . .	0·8728	+ 2·2	—
161·3–163 . . .	0·8753	+ 0·5	—
163–170	0·8772	− 2·8	—
Residue	0·9243	− 1·0	—

(D)

Fractions.	Sp. G.	α	N.
160	0·8712	+ 4·4	1·46375
160	0·8694	+ 3·7	445
160–160·5 . . .	0·8724	+ 2·2	474
160·5–161·5 . . .	0·8828	+ 0·4	425
161·5–163 . . .	0·8735	− 1·7	998
163–168	0·8732	− 5·8	1·47312
Residue	0·9319	—	1·48516

Each series covers a considerable range of optical activity. Optical activity most nearly approached to 160°, although in no case did it actually occur.

The following turpentine fractions were bulked and fractionally distilled :—(From *c*) 161·3–163° and 163–170°, (from *b*) 161–169°, (from *d*) 161·5–163° and 163–168°. The boiling point, optical rotation, and refractive index of each being noted, with the results as tabulated below :—

TABLE 4.

Fraction.	Sp. G.	α	N.
159·2	0·4641	+ 1·66	1·46227
159·2–159·5 . . .	0·8707	+ 1·04	464
159·5–160	0·8657	+ 0·85	454
160–160·2	0·8659	+ 0·5	435
160·2–160·4 . . .	0·8668	− 0·04	405
160·4–160·7 . . .	0·8677	− 0·48	386
160·7–161	0·8653	− 0·96	553
161–161·4	0·8678	− 1·78	613
161·4–162·2 . . .	0·8680	− 3·34	692
162·2–163·1 . . .	0·8698	− 4·92	751
163·1–164·2 . . .	0·8707	− 6·38	831
164·2–165·2 . . .	0·8659	− 7·92	881
165·2–166·2 . . .	0·8664	− 8·64	603
166·2–168·2 . . .	0·8664	− 9·32	563
168·2–171·2 . . .	0·8688	− 10·04	584
171·2 and over . .	0·8685	—	405
Residue	0·9512	—	—

In no case did we obtain optical inactivity. Of fifteen fractions only four were dextro-rotatory, the remainder being lævo-rotatory, the nearest being that fraction boiling between 160·2° and 160·4° with an optical rotation of – 0·04, and refractive index 1·46405. This nearly inactive portion represents less than 0·5 per cent. of the total amount experimented on.

We now distilled 50 lbs. of "terebene" which passed the B.P. requirements, with the exception that 5 per cent. distilled between 180–185° (this point we deal with later), and left only a trace of viscid residue; noting the optical rotation, refractive index and specific gravity, with the following results:—

TABLE 5.

Fraction.	Sp. G.	α	N
150	0·8753	+ 2·8	1·46207
150–164	0·8766	+ 1·4	623
164–169	0·8754	+ 1·1	584
169	0·8733	+ 0·8	603
169–169·5	0·8832	+ 0·5	603
169·5–169·7 . . .	0·8807	+ 0·4	652
169·7–169·9 . . .	0·8835	+ 0·4	702
169·9–170	0·8968	0	771
170–170·5	0·8942	0	672
170·5–171	0·8892	– 0·1	683
171	0·8855	– 0·4	702

We have here an optical range from eleven fractions + 2·8 to –0·4, whilst two fractions, 169·9° to 170°, and 170° to 170·5°, were optically inactive. The fraction boiling at 169° was fractionally distilled into ten fractions, as below:—

TABLE 6.

Fraction.	Sp. G.	α	N.
160	0·8874	+ 2·8	1·46445
160–161	0·8868	+ 2·3	425
161–162	0·8838	+ 2	287
162–163	0·8907	+ 1·4	603
163–165	0·8858	+ 1	563
165–166	0·8938	+ 1	652
166–167	0·9128	– 0·8	929
167–168·5	0·9124	– 0·8	959
168·5–171·5 . . .	0·9082	– 1·4	998
Residue	0·9217	– 3	1·47761

In this instance we again failed to hit on any optically inactive portion. It is to be noted that the presence of oxidised substances occurring in the residues noted in our experiments has a probable marked effect on the initial bulk rotation.

A number of authors conjecture the presence of cymol and pinene as forming the inactive portions of "terebene." Thus, Riban (*C.S.J.*, 1873) states that "the liquid resulting from the distillation of turpentine oil from oil of vitriol, and to which the name of terebene has been given, is a mixture of pure terebene and cymene." Wright (*C.S.J.*, 1873) considers the cymene to be pre-contained as such. Tilden (*C.S.J.*, 1878) "to the presence of cymene may also be ascribed my failure to obtain a crystallised nitroso compound from the terebene on which I operated." *United States Dispensatory* states :—"Some cymol is always produced, and by continued action of the acid the terebene is stated to be entirely converted into cymol and colophene," whilst more recently Drs. Power and Kleber, in a paper on terebene, suggest an amended text for the definition of "terebene"—viz., "it consists chiefly of the hydrocarbons, dipentene, and terpinene, with some cymol and camphene."

We examined cymol (metamethylpropylbenzol), optical rotation, + 0·7, refractive index, 1·47194; cymol (from camphor), optical rotation + 5·6, refractive index, 1·48081; cymol (from oleo cumini), optical rotation + 14·4, refractive index, 1·47400; pinene, optical rotation + 41, refractive index, 1·46167.

On subjecting these to fractional distillation we obtained the following results:—

TABLES 7.

Cymol (Metamethylpropylbenzol).

Fraction.	Per cent.	α
—155	10	0
155–160	15	0
160–165	26	0
165–180	31	0
180	18?	0

Cymol (from Camphor).

Fraction.	Per cent.	α
—170	28	+3·2
170–173	30	+4·8
173–177	20	+5·8
177–182	18	+6·4
182	4?	

Cymol (ex Oleo Cumini).

Fraction.	Per cent.	α
160–165	26	+ 8·6
165–167	28	+13·4
167–170	30	+17·2
170–175	9	+17·8
175	7	

Pinene.

Fraction.	Per cent.	α
—158	14·3	+43
158–159	29	+43·6
159–160	11·3	+41·8
160–162	15·7	+41·8
162–167	14	+41·2
167–175	15?	+41·2
175		

All these are capable of fractionation. The fractions show a range of dextro-rotation. In the case of cymol ex camphor the lowest boiling fractions show the least rotation, whilst with pinene and cymol ex ol. cumini the lower boiling points show the highest rotation, as in turpentine oil, whilst the synthetic cymol gives no rotation.

It was observed by Sobrero, Berthelot, and others that turpentine heated to 300° C. for several hours, in sealed tubes, was converted into polymeric modifications of high molecular weight, which was extremely oxidisable, and was converted into a viscid mass on exposure to the air in a few hours. In this connection it is worthy of note that Tilden (*J.C.S.*, 410, 1884), as a result of subjecting turpentine oil to heat under certain conditions, was able to obtain,

amongst other products, what he termed a "depolymerisation" product C_5H_8. We find from the following experiment that some slight polymerisation occurs at comparatively low temperatures—viz., the boiling point of turpentine. Turpentine of an optical rotation + 6·9 was boiled in a flask fitted with a reflux condenser for forty minutes and allowed to cool. Optical rotation was then + 6·7. On again boiling for twenty-four hours and cooling, the optical rotation was + 5·9. In another experiment turpentine oil, optical rotation + 6·9, was boiled for forty hours, optical rotation was then + 4. In both experiments the colour of the oil changed to light yellow a few minutes after commencement of boiling, and at the end of the experiment was of a deep yellow.

With regard to the effect of keeping terebene for a length of time, we do not find that the variations are very great, for example, a sample P.B. eighteen months old gave an optical rotation of + 2·1, another for the same period + 3·4. These were in corked bottles three-quarter full. We kept samples in amber, blue, and green-stoppered bottles full and half full for six months in diffused light, and found no variation in the full, and not more than + 0·4 in the half-full bottles. The colour of container, contrary to the statement of some observers, did not appear to have any effect.

United States Dispensatory (18th edition) gives a method for producing "terebene" by acting on turpentine oil with $\frac{1}{20}$ part of its weight of sulphuric acid. It is obvious, however, that as nearly every sample of turpentine oil has a different initial optical rotation, so more or less acid is necessary for each sample. A turpentine of very high rotation requires more acid, the operation is more prolonged, and consequently the product is not the same as regards the characteristics other than optical rotation.

It may be taken as a general rule, the higher the initial rotation of the *American* turpentine oil, the smaller the product of inactive mixture capable of steam distillation and the higher the specific gravity.

We have obtained a sample of Russian turpentine oil with an optical rotation of + 31·6, and refractive index 1·46683. This oil had a crude and particularly objectionable smell. The specific gravity was 0·855. Thirty per cent. distilled between 160–165, 66 per cent. between 165–180, and 4 per cent. of a somewhat viscid residue above 180 remained. The colour was slightly yellow; when rectified by steam distillation the objectionable odour was only slightly removed, its optical rotation being altered to + 31, and refractive index 1·46534. A portion treated according to the

directions in the *United States Dispensatory* with $\frac{1}{20}$ of its weight of sulphuric acid, neutralised and distilled in a current of steam, gave an optical rotation of + 29·7, and refractive index 1·46702. After the addition of one-third its weight of sulphuric acid the rotation was + 6·6, whilst a very small portion only of optically inactive mixture was obtained on further treatment with sulphuric acid, the resulting products still retained their crude odour.

We have noted that, when a considerable quantity of acid has been used on a turpentine oil of high rotation, or when temperature has accidentally risen, the residue from the steam distillate is whiter and much thicker than when only a small quantity of acid has been used. By continued action of sulphuric acid, a product can be obtained of which only a small percentage is capable of steam distillation, and the consistency of which is like that of honey. This compound does not dry in the air even after the lapse of several months, and invariably contains, even after continued boiling with water, a considerable percentage of sulphur compounds. It is evident that the continued action of sulphuric acid under certain conditions may occasion very considerable polymerisation.

Our general results agree with those of Power and Kleber (*Pharm. Rund.*, xii., No 1, 1894), that it is not possible to obtain any considerable amount of product having so low a boiling point as that generally stated for terebene, 150–160°.

We have confined our research to the investigation of the physical side, and have not attempted the identification of the constituents from a chemical standpoint. The chaotic condition of the literature of turpentine and terebene, the varied opinions and diverse results of various workers raises the question as to what are the possible and probable sources of error or difference when working on such complex subjects as these. The probability of the occurrence of one or several mixtures of constant boiling point must be considered, particularly when working on small quantities.

In a very able and interesting paper, Garnett Ryland (*A.C.J.*, 22, 314–396), the author proves by a large number of experiments the very common occurrence of mixtures of constant boiling points, and the consequent impossibility of separating liquids by fractional distillation.

In the complex mixtures of isomerides and polymerides, like turpentine oil and terebene, it is extremely probable that several such mixtures are attained during fractionation, more so even in a mixture composed of allied compounds than in the mixtures of

unlike compounds investigated by Garnett Ryland. A reviewer of this author's paper in the *American Chemical Society's Journal* (vol. xxi., No. 5, 75) points out that if the vapour pressure for any composition of the mixture has a minimum value lying between the two limited vapour pressures of the pure liquid, it must necessarily have also a maximum value for some other composition, and *vice versâ*, and therefore it must be possible to obtain two different mixtures of constant boiling point. It is known that the boiling points of such mixtures vary several per cent. at different pressure. This suggested to us the means of separating constituents of such mixtures, viz., by varying the pressure under which distillation was conducted, and this point is now under investigation. The optical rotation is dependent on the composition of the solution. This composition varies according to the source of the original oil, the method of rectifying, subsequent treatment to form terebene (whether performed on large or small quantities), and the temperature, age, and oxidation, all elements of variation in the results of different observers.

Armstrong (*Proc. Chem. Soc.*, 1890), in confirming Sobrero's experiments (1851, *Compt. Rend.*, 33–60), noted that, when the turpentine oil is exposed to light in the pressure of moisture and oxygen, a crystalline substance is formed of the composition $C_{10}H_{16}H_2O_2$ of high optical activity, and conjectured that this substance is always present as a product of the oxidation of turpentine oil.

It is highly probable that the varying optical activity is due to the presence of this and other oxidation products to some extent.

Armstrong has shown that under certain conditions combination with water to form a crystallised hydrate $C_{10}H_{16} + 2H_2O$ occurred. It is not improbable that this crystal molecule exists to a small extent in all turpentine oil, and that only under the influence of heat the water is freed, thus causing variation of rotation and boiling point. In this connection it is noticeable that, if turpentine oil is treated by repeated agitation and standing with exsiccated calcium chloride, decanted and distilled, some water is always found in the first runnings of the distillate. Landolt (*Lieb. Ann.*, 1877, 189–311) has shown that if the optically active substance is dissolved in various indifferent solvents varying rotation results, and also (*Das Optische Drehung*, 2nd, 30) that many substances show widely various rotations when dissolved in various solutions, whilst molecular weights are found to be the same. If any portion of turpentine oil or terebene gives an inactive combination, then, if

we regard any such portion as the solvent, the rotary power is influenced by the nature of this portion. We know that optical inactivity can be produced by various mixtures of polymeric and isomeric modification, thus we may have some explanation of the very diverse optical activity recorded by various workers. During the last twenty years the modes of rectification of turpentine oil have been altered and improved, and the turpentine oil of to-day is somewhat different to that on which the earlier investigators worked.

We have instanced the above as a few possible sources of variation. From the results of our experiments we are inclined to doubt the existence under ordinary conditions of manufacture of a distinct inactive modification of the constituents of *American* turpentine oil, and hence of terebene, from such oil.

In our experience in the manufacture of terebene on a technical scale from American turpentine oil, we find that with due and careful attention to the conditions of temperature, time, and addition, precautions to prevent oxidation, the requirements of the B.P. can be reasonably complied with, with the exception, however, that a certain latitude should be extended. Under the most careful conditions we find that the average of many batches rules that 5 per cent. distils over 180, but that not more than a trace of this should be viscid. We do not attribute this trace of viscid matter to the presence of resin in the fresh turpentine, but to subsequent oxidation, partly due to heat used in examination. We are, however, inclined to suggest the deletion of the test allowing 15 per cent. of distillate under 165, and substitution of "not more than 5 per cent. should distil below 160." We also suggest as a definition of terebene "*a mixture of polymerides and isomerides of the empyrical formula* $C_{10}H_{16}$, *together with small quantities of oxidation products, formed by the action of sulphuric acid on oil of turpentine.*"

The foregoing experiments refer to American turpentine oil only, except where otherwise indicated. When, however, we deal with French oil of turpentine we have a quite different state of conditions. This oil shows a high lævo-rotation; herewith we give a set of fractions from French turpentine oil of initial rotation $-55{\cdot}7°$:—

TABLE 8.

Fraction.	Per cent.	α
—157	7·4	−60·8
157–157·3	2·4	−60·8
157·3–157·5	3·4	−60·8
157·5–157·8	2·3	−60·7
157·8	1·6	−60·4
157·8–158	25·8	−60·4
158–159	2·5	−56·5
159–159·3	12·5	−55·7
159·3–159·5	2·5	−55·4
159·5–160	2·4	−55·1
160–160·5	4·0	−54·8
160·5–162	1·4	−54·1
162–162·5	3·0	−53·3
162·5–163·5	1·2	−53·2
163·5–164	1·7	−53
164–165	1·7	−50
165–166	4·9	−49·1
166–170	1·2	−48
170–173	0·9	−46·5
173–175	0·4	−46
175–180	0·8	−46
180–192	5·5	−34
190–200	2·1	−23·2
200–210	4·3	− 2·2
210–230	2·3	+19·2
230—		*v.* viscid.

We thus see that every fraction gives a lævo-rotation except that fraction boiling between 210–230°, which was somewhat viscid and coloured, giving a rotation of + 19·2°. It is possible, however, that this high dextro-rotation may be due to oxidation in the course of fractionation, as all fractions up to 200° are very lævo-rotatory. As in the case of the American oil, the higher the boiling point the lower the rotation, compared to the initial rotation, and the higher the specific gravity. Our observations thus show that the French oil has a greater tendency to oxidise than the American, and is intermediate between the latter and the Russian oil. We give below the results of fractionating a "terebene" obtained from this source, which "terebene" showed no optical activity:—

TABLE 9.

Fraction.	Per cent.	α
—158	12	−1
158–161	20	−1·4
161–163	9	−0·8
163–167	28	0
167–170	15	−1
170–180	16	*v.* coloured.

This range of − 1 to 0 is highly significant, pointing as it does to the existence of a dextro-rotatory product in the residue, due probably to oxidation; as four fractions are lævo-rotatory, and one, which forms a considerable portion of the whole, is optically inactive, but still of composite nature, which is not shown by optical activity of its fractions, but by the lack of constancy in boiling point. Compared to the yield of "terebene" from the American oil, that formed from the French gives a very small product on distillation with ordinary steam, and from this we conclude that the Continental practice must be to use highly superheated steam or ordinary distillation, as the boiling points, which are higher than those allowed by the B.P., give us foundation for this belief.

Two samples of "terebene" were obtained from Continental sources, both being optically inactive; of these the first gave 18 per cent. between 180–210°, and 12 per cent. over 210°. The second gave 10 per cent. between 185–200°, and 30 per cent. over 200°, whilst English samples in no case gave over 8 per cent. of distillate over 180°.

It is true that the directions commonly given for making "terebene"—that is, by acting on turpentine oil with sulphuric acid till optically inactive—are not feasible if the American oil be used; with the French oil, however, these conditions are possible, and much confusion would have been saved by definite instructions as to which oil to use.

It is our intention at some future date to investigate oil and "terebene" from all possible sources—that is, American, French, and Russian—working so as to avoid as much as possible any polymerisation, which end may be attained by fractionation *in vacuo*, or by working on a mixture of the substance with ether or some such volatile liquid, of low boiling point, and which can be subsequently removed.

NOTE ON LIQUOR FERRI PERCHLORIDI FORTIS.[1]

By Thomas Tyrer and Albert Levy.

In a paper read before the British Pharmaceutical Conference last year, there was considerable discussion as to how the percentage and specific gravity given by the P.B. stand in comparison with the various tables and with other pharmacopœias. Manufacturers do not make iron perchloride solutions according to the method described by the Pharmacopœia.

Barnard S. Proctor, in his manual of pharmaceutical testing, noted "that manufacturers do not now commonly follow this method." Even if iron perchloride solutions are prepared according to the P.B. method, such solutions do not stand both tests required by the Pharmacopœia, viz. (1) the amount of iron oxide obtained by incineration of the ammonia precipitate from 5 c.c. of the solution (= 1·6 gramme); (2) specific gravity of about 1·420. If we allow for the word "about," a variation in specific gravity of 1·419 to 1·425, the percentage of iron perchloride calculated as Fe_2Cl_6 according to the P.B. varies from 45·81 to 45·61, as follows:—

S. G.	Per cent. Fe_2Cl_6	
1·419	45·81	=1·6 gm. Fe_2O_3 in 5 c.c. liquid.
1·420	45·77	
1·421	45·74	
1·422	45·71	
1·423	45·67	
1·424	45·64	
1·425	45·61	

The British Pharmacopœia of 1885 required the following, viz., "specific gravity about 1·420. A fluid drachm diluted with 2 fluid ounces of water gives, upon the addition of an excess of solution of ammonia, a reddish-brown precipitate, which, when well washed and incinerated, weighs between 15 and 16 grains." If the same allowance for the word "about" is made as before, the percentage of ferri sequichloride is as follows:—

S. G.	Per cent. Fe_2Cl_6	S. G.	Per Cent. Fe_2Cl_6
1·419	39·19—41·79	1·422	39·10—41·70
1·420	39·15—41·76	1·423	39·07—41·67
1·421	39·13—41·73	1·424	39·04—41·64
		1·425	39·02—41·61

[1] The blocks used to illustrate this paper were kindly supplied by Messrs. Thomas Tyrer & Co., Limited.

It is impossible, as has often been stated by various authors, to obtain in commercial samples of 1·420 the high percentage required by the P.B., 1898. We have tabulated below (p. 483) a list of different commercial samples of our own and other manufacturers' make, which we have carefully examined.

A sample "F," made strictly according to the requirements of the Pharmacopœia, yielded 1·424 gm. of iron oxide at a specific gravity 1·42479. The maximum quantity of Fe_2O_3, which 5 c.c. of an iron perchloride can give according to the P.B., is 1·44 gm. theoretically.

A sample made exactly according to Mr. Bird's suggested alteration of the P.B. method (*B.P.C.*, 1899) (G 1) yielded 1·644 gm. of Fe_2O_3. Mr. Bird found in his preparation (G 2) 1·604 gm. Fe_2O_3 in 5 c.c.

In the discussion following Mr. Bird's paper, it was pointed out how very different the various tables of various authors are. We have set out a list of different tables on page 484).

Franz (*J. Pr. Ch.*, 2, 5, 283).—The gravities are taken at 17·5°. This table is adopted in several works; also in Dr. Biedermann's *Chemiker Kalender*. Schult's (*Forh. Shand. Natur.*, 1868, 452) gravities being taken at 14·6°. Roscoe and Schorlemmer adopted the table by Fremy taken at 17°. Hager's (*Fres. Zeitschr.*, 27, 278, 306, 1888), which is adopted in the 2nd edition of the *Physikalisch Chemische Tabellen* of Drs. Landolt and Börnstein.

From these tables it will be noticed that Fremy's and Franz's tables are practically the same, but there is too much difference in the temperature at which the gravities were taken to compare Hager's with Schult's table.

The data given by the various pharmacopœias are as shown in Table 3, p. 485.

We prepared iron perchloride solutions by dissolving samples of ordinary iron perchloride solid as well as sublimed iron perchloride in water, and examined their specific gravity and percentage by gravimetric methods. The results of our investigations are tabulated on page 483.

Sample "E" was from iron sesquichloride solid, prepared by evaporation, whilst the samples D 1, D 2 were from sublimed iron sesquichloride, and D 3, D 4 were from another batch of sublimed iron sesquichloride.

The curves show the percentage of iron sesquichloride we found for the different tables, and also for the different foreign pharma-

Table 1.

Analytical Data.

Samples.	Specific Gravity. at 60° F.			Iron Analysis.			S. Gr.	5 c.c. = gr. Fe_2O_3.	100 parts contain Fe.	100 parts contain Fe_2Cl_6.
	I.	II.	III.	I.	II.	III.				
A 1	1·42000	1·41992	—	12·86	12·77	—	1·41996	1·298 gr.	12·81	37·13
A 2	1·43097	1·43107	—	13·22	13·37	13·20	1·43102	1·355 „	13·26	38·48
A 3	1·48978	1·49004	—	14·54	14·50	—	1·48991	1·545 „	14·52	42·14
B 1	1·42279	1·42293	—	13·77	13·53	13·64	1·42286	1·382 „	13·65	39·63
B 2	1·43849	1·43806	—	14·07	14·07	—	1·43827	1·445 „	14·07	40·83
B 3	1·47063	1·47068	—	14·98	14·86	—	1·47065	1·567 „	14·92	43·30
B 4	1·49173	1·49152	—	15·18	15·27	—	1·49162	1·619 „	15·22	44·19
C	1·41752	1·41789	1·41781	13·39	13·22	13·30	1·41774	1·347 „	13·30	38·60
H	1·42437	1·42398	—	12·63	12·87	—	1·42417	1·297 „	12·75	37·00
B.P. 1898				requires			1·42	1·6	15·77	45·77
B.P. 1885							1·42	1·3681–1·4593	13·49–14·38	39·15–41·76
F	1·42480	1·42478	—	14·01	13·97	—	1·42479	1·424	13·99	40·61
G 1	1·48807	1·48809	—	15·52	15·47	15·39	1·48808	1·644	15·46	44·86
G 2	—	—	—	—	—	—	1·488	1·604	15·09	43·79
E	1·42003	1·42001	—	13·84	13·76	—	1·42002	1·400	13·80	40·05
D 1	1·42002	1·42001	—	13·94	13·95	—	1·42002	1·416	13·95	40·50
D 2	1·49215	1·49204	—	15·55	15·54	—	1·49209	1·656	15·54	45·09
D 3	1·44297	1·44310	—	16·30	16·14	—	1·44303	1·672	16·22	47·07
D 4	1·47260	1·47268	—	16·40	16·53	—	1·47264	1·731	16·46	47·75

TABLE 2.

Specific gravities taken by :—

Per cent. Fe_2Cl_6.	Franz 17·5°.	Schult 14·6.	Fremy 17°	Hager 17·5.	Per cent. Fe_2Cl_6.
1	—	—	1·0073	—	1
2	1·0146	—	—	—	2
4	1·0292	—	—	—	4
4·65	—	1·0382	—	—	4·65
5	—	—	—	1·042	5
6	1·0439	—	—	—	6
8	1·0587	—	—	—	8
10	1·0734	—	1·0734	1·087	10
10·45	—	1·0918	—	—	10·45
12	1·0894	—	—	—	12
14	1·1054	—	—	—	14
15	—	—	—	1·131	15
16	1·1215	—	—	—	16
16·80	—	1·1517	—	—	16·80
18	1·1378	—	—	—	18
20	1·1542	—	1·1542	1·180	20
22	1·1746	—	—	—	22
22·54	—	1·2107	—	—	22·54
24	1·1950	—	—	—	24
24·60	—	1·2318	—	—	24·60
25	—	—	—	1·234	25
26	1·2155	—	—	—	26
28	1·2365	—	—	—	28
30	1·2568	—	1·2658	1·292	30
32	1·2778	—	—	—	32
33·25	—	1·339	—	—	33·25
34	1·2988	—	—	—	34
35	—	—	—	1·352	35
36	1·3199	—	—	—	36
36·95	—	1·3824	—	—	36·95
38	1·3411	—	—	—	38
40	1·3622	—	1·3622	1·415	40
41	—	1·4361	—	—	41
42	1·3870	—	—	—	42
44	1·4118	—	—	—	44
45	—	—	—	1·481	45
46	1·4367	—	—	—	46
48	1·4617	—	—	—	48
49·61	—	1·554	—	—	49·61
50	1·4867	—	1·4867	1·547	50
52	1·5153	—	—	—	52
54	1·5439	—	—	—	54
55	—	—	—	1·612	55
56	1·5729	—	—	—	56
58	1·6023	—	—	—	58
60	1·6317	—	1·6317	1·670	60

TABLE 3.

	Sp. G.	P. cent. Fe.	P. cent. Fe_2Cl_6.
Pharmacopea Austrica (Viennæ, 1889)	1·28	—	—
Pharmacopea Belgica II. (Bruxelles, 1885)	1·26	8·97	26
Pharmacopea Danica (Kopenhagen, 1893)	1·298 1·302	10	— —
Pharmacopea Nederlandica III. (S. Gravenhage, 1889)	1·441 1·488	14·5 15·5	— —
Codex Medicamentarius (Paris, 1884)	1·26	—	26
Pharmacopœa Germanica III. (Berlin, 1895)	1·280 1·282	10	—
Pharmacopœa Hungarica II. (Budapest, 1888)	1·280 1·283	10·3	—
Farmacopea Ufficiale d'Italia (Roma, 1892)	1·469 1·480	—	44–45
Pharmacopœa Japonica (Tokyo, 1891)	1·280 1·282	10	29
Pharmacopœa Mexicana (Mexico, 1896)	1·26	—	—
Pharmacopœa Norvegica (Kristiania, 1895)	1·280 1·282	10	30
Rossieskaia Pharmacopea IV. (St. Petersburg, 1891)	1·280	—	—
Farmacopea Oficial Espanola VI. (Madrid, 1884)	1·26	—	27
Pharmacopœa Helvetica III. (Zürich, 1893)	1·28 1·29	10	—
Pharmacopœia of the United States VII. (Philadelphia, 1894)	1·387	13	37·8

copœias, as well as our analytical results. In studying the curves it will be found that practically all data in foreign pharmacopœias, as well as solutions prepared by dissolving *ordinary* sublimed sesquichloride in water, agree with Hager's table, which shows that this table adopted by Landolt and Börnstein is correct. Our examination of commercial samples, A 1, A 2, A 3, B 1, B 2, B 3, B 4, C, and H, showed in the majority of cases too low a percentage, compared with Hager's tables. Only samples made exactly in accordance with the conditions prescribed by the P.B. ($F G_1 G_2$) agree with the percentage shown by the curve, which shows that the P.B. *method* can be worked with certain careful precautions, but its results do not give P.B. percentage.

With regard to the extraordinary difference in percentage of iron found in examining the samples D 1, D 2, D 3, D 4, we examined the sample D 1, compared with D 3, with the following results :—

Sample D 1.	1.	2.
S. G.	1·42002	1·42001
Per cent. Fe	13·94	13·95
Per cent. Cl	25·80	25·89

Sample D 3.	1.	2.
S. G. . . .	1·44297	1·44310
Per cent. Fe . .	16·30	16·14
Per cent. Cl . .	26·92	26·74

The difference in the percentage of iron of 2·27 per cent. for only 0·02301 difference in specific gravity, and only a slight difference of 0·99 per cent. of chlorine, led us to think that the two different solutions of iron chloride had not the same composition. We made an approximation of the molecular weight of the iron chloride solutions by dividing the percentage of iron corresponding to chlorine by the corresponding atomic weight. We found in sample D 1, 2 of iron, corresponding to 5·84 chlorine, whilst 3 of iron correspond to 8·63 of chlorine, which makes the two formulæ possible :—

$$\frac{Fe_2Cl_6}{Fe_2Cl\,(5{\cdot}84)} \quad \text{or} \quad \frac{Fe_3Cl_8}{Fe_3Cl\,(8{\cdot}63)}.$$

In order to see how our results agreed with either of these formulæ, we calculated the difference between theoretical amount of chlorine corresponding to the quantity of iron actually found, and the quantity of chlorine actually found, and *vice versâ*, and difference between the theoretical amount of iron corresponding to the quantity of chlorine actually found and the quantity of iron actually found.

We give herewith the results of our calculations :—

Fe_2Cl_6.		Fe_3Cl_8.	
13·95 Fe corresponds to— P.c. Cl	25·84 Cl corresponds to— P.c. Fe.	13·95 Fe corresponds to— P.c. Cl.	25·84 Cl corresponds to—
Theory . . 26·49	Theory . . 13·66	Theory . . 23·55	Theory . . 15·31
Analysis . 25·84	Analysis . 13·95	Analysis . 25·84	Analysis . 13·95

This shows for the solution D 1, the formula Fe_2Cl_6 is least inaccurate.

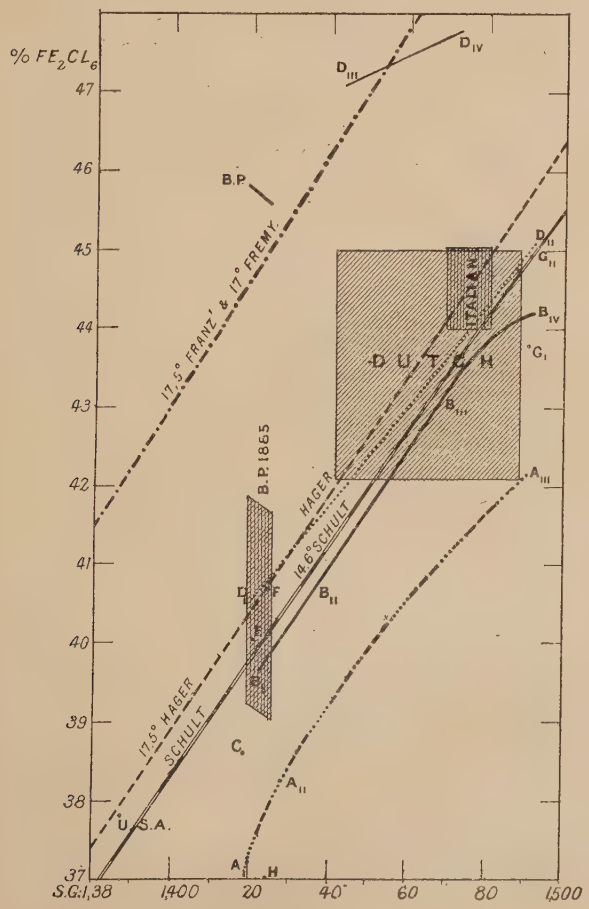
For sample D 3, by dividing as before the found percentage of iron corresponding to chlorine by the corresponding atomic weight of iron and chlorine, we found that 2 of iron corresponded to 5·23 of chlorine, whilst 3 of iron corresponds to 8·19 of chlorine, which makes the following two formulæ possible :—

$$\frac{Fe_2Cl_6}{Fe_2Cl\,(5{\cdot}23)} \quad \text{or} \quad \frac{Fe_3Cl_8}{Fe_3Cl\,(8{\cdot}19)}.$$

We make the same calculations as before to ascertain which formula can be best adopted, and give the results below :—

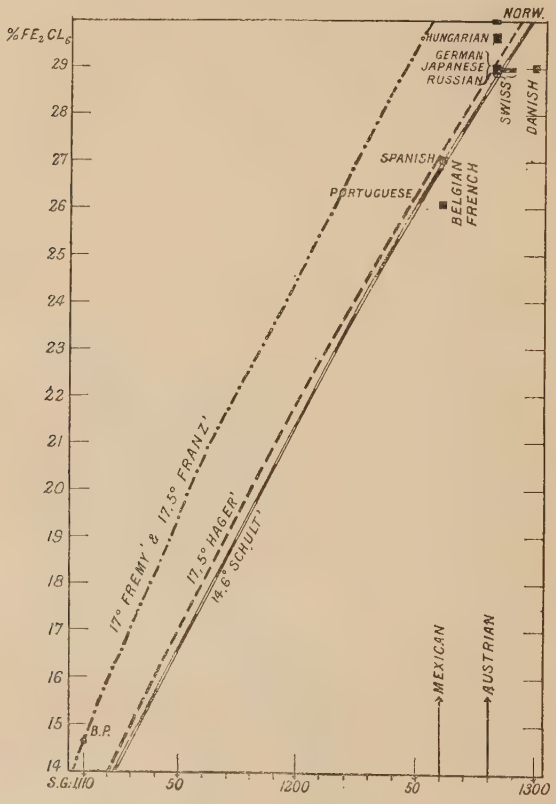
Fe_2Cl_6.		Fe_3Cl_8.	
16·22 Fe corresponds to—	26·83 corresponds to—	16·22 Fe corresponds to—	26·83 Cl corresponds to—
Theory . . 30·80	Theory . . 14·13	Theory . . 27·38	Theory . . 15·90
Analysis . 26·83	Analysis . 16·22	Analysis . 26·83	Analysis . 16·22

This table shows that Fe_3Cl_8 is the possible formula.



The reason of this difference between the two samples was found in the fact that a sample from which the solutions D 3 and D 4 were prepared was kept for some time exposed to light; they may partly have been decomposed to ferrous chloride in thus forming a ferroso-ferric chloride ($Fe Cl_2 + 2 Fe Cl_3$) or $Fe_3 Cl_8$.

It is probable that the table of Franz was compiled from the



results of experiments made by dissolving the freshly-prepared and sublimed iron sesquichloride to certain gravities, and it would seem that this almost theoretical table was adopted as the P.B. standard.

We again emphasize the fact that it is impossible to get this high percentage on the technical scale, and even if great care is taken in making a sample exactly according to the P.B. directions

(F.), only a percentage which is near Hager's table can be obtained, whilst the best samples obtained in commerce, and not made according to the P.B., 1898, are of percentage within the limits of the P.B., 1885 (sample B 1). Considering the fact that several samples prepared by various manufacturers, as well as by dissolving ordinary solid iron perchloride in water, *practically* agree with the requirements of the P.B., 1885, and of nearly all foreign pharmacopœias, and with Hager's table, we should suggest returning to the standard of the 1885 British Pharmacopœia in a future edition.

The PRESIDENT said these papers must have taken an immense amount of time to put together. What Mr. C. T. Tyrer had said with regard to terebene was of considerable importance.

Mr. HOWARD could bear out what Mr. Tyrer had said on ferri perchloridi and terebene. He had found the same difficulty as Mr. Tyrer had with perchloride, that it appeared to be impossible on a commercial manufacturing scale to get a liquor giving the B.P. results by the B.P. process. With regard to the fractionating of terebene, his experience was the same as Mr. Tyrer's. He had had no experience of fractionating French terebene, and was much interested to hear that there was a large inactive fraction. With regard to the American turpentine, which was more largely used, probably because it was cheaper than the French, there was in every sample which he had seen fractionated a mixture of dextro- and lævo-rotatory products in the terebene. The different proportions of the dextro- and lævo-rotatory compounds varied very considerably in different batches. His opinion was that the older the turpentine from which the terebene was prepared the more the tendency was to a result which was lævo-rotatory, and also a high boiling point. In some cases there was more than 5 per cent. of a body of high boiling point in genuine terebene, which was not resinous; and if that body was harmless, he saw no reason why it should not be allowed. This body was a difficult thing to collect, because distilling over the naked flame altered its character entirely, consequently one had to fractionate by steam, which was a slower process than by fire. His own experience entirely bore out Mr. Tyrer's investigations.

Mr. BIRD was strongly of opinion that the Medical Council intended liquor ferri perchloridi to be judged by the ferric oxide rather than by its specific gravity, because it was a well-known fact, as had been pointed out, that the two did not agree.

In the British Pharmacopœia process the starting point was a definite quantity of hydrochloric acid. The B.P. operation was directed to be performed in a flask which would prevent the escape of hydrochloric acid, but on the manufacturing scale it was probably done in a large pan, where the hydrochloric acid might escape. He thought it was really a splendid testimonial to the utility of the Conference that it was a gathering at which these results could be published and very useful information elicited. Mr. Tyrer had done greater service than anyone else in connection with terebene. The literature of terebene was most obscure, and it was very difficult to find out anything about it.

Mr. C. T. Tyrer, in reply, said Mr. Bird's criticisms were quite just; but when working on a large scale an excess of acid was unavoidable.

The President said they owed a double debt of gratitude to Mr. C. T. Tyrer for having read these papers.

A hearty vote of thanks to the authors of these admirable papers was passed unanimously.

In the absence of the author, the following paper was read by Mr. Naylor.

THE BRITISH PHARMACOPŒIA AS A STANDARD.

By D. B. Dott, Ph.C., F.I.C., F.R.S.E.

The British Pharmacopœia is admittedly the standard according to which chemists are bound to prepare all medicines which are official. Even that simple statement requires qualification. The medicines must only be of official standard when they are dispensed to the order of a physician, or when the conditions and circumstances of sale imply that they are of pharmacopœial standard. It would be absurd to suppose that a chemist who sold soft soap which was not made from olive oil, or stick potash which did not contain 90 per cent. of potassium hydroxide, was guilty of an offence. Then there is the important matter of deterioration. In this connection I think it is unfortunate that a minimum standard should have been fixed for spirit of nitrous ether. It would have been much better to have fixed the minimum only for *liquor æthyli nitritis*. Doctors would then have understood to order the latter preparation, and the popular remedy would have done as much

good as ever it did. There is a further consideration to which sufficient attention has not been paid. It by no means follows that because the Pharmacopœia states that a certain amount of an ingredient is to be used in making a preparation, an analyst is to certify that he has made a calculation and does not find the amount in it. The Pharmacopœia orders one vol. of liquid extract of ipecacuanha to be mixed with nineteen vols. of sherry wine to make ipecacuanha wine; but if, after keeping, the wine has precipitated or part of the alkaloids been lost by decomposition, it will not do for an analyst to say that the wine is not of B.P. strength.

The Pharmacopœia does not state the strength, and the analyst is not authorised to invent one. Similarly, the Pharmacopœia orders one part of camphor to be dissolved in four fluid parts of olive oil, but it does not state the per centage of camphor to be found in the finished product. Yet we have a number of respectable men hailed before the judge and fined because their camphorated oil is deficient in camphor according to the analyst's calculation. One of our instructors writes to a journal and tells us that because the Pharmacopœia does not say "heat," it means cold. Another tells us that no sensible man would think of using heat, because the camphor dissolves without it. If he had looked up some of the older books on pharmacy, he would find that a certain amount of heat is enjoined. After all, it is very doubtful whether camphorated oil as popularly sold is bound to be made with the B.P. proportions for liniment of camphor. It would be difficult to prove that a customer was prejudiced when supplied with an article that would satisfy an American or Continental physician. Notwithstanding these facts, prosecutions for sale of deficient camphorated oil have been so frequent of late that the proverbial intelligent foreigner will be apt to think that the favourite method adopted by the English Pharmacist in order to resist the competition of the stores is to sneak 15 per cent. out of his camphorated oil.

Allowing that the Food and Drugs Act, Pharmacy Acts, and all the rest of them might be much improved, are we not right in saying that the law suffers very badly from maladministration? Police prosecutors, public analysts, and inferior judicatories may divide the blame among them, and their perverse use of the Pharmacopœia as a standard has much to do with their unfortunate decisions. If they were consistently wrong, the thing would not be so bad, but the magistrates of the North delight in differing

from their brethren in the South, while the county justices glory in arriving at an independent judgment differing entirely from that of the sophisticated stipendiary. The analysts groan under the burden of Somerset House, yet it would be safe to say that in 99 per cent. of appeals, the Government laboratory has been right and the public analyst wrong. It would be wearisome to recount the innumerable instances of confused interpretations of the Pharmacopœia as a standard, but a few examples may be useful to show the wisdom with which the world is governed. In the North of England a licensed victualler was fined five shillings and costs for selling soda water not of the standard of the then Pharmacopœia, the Bench usefully recommending that all aërated waters should be labelled with their exact contents. From this decision we learn that the Pharmacopœia is a standard not only for chemists but also for publicans. It also hits at a grocer, because one was fined for selling non-pharmacopœial camphorated oil. On the other hand, a well-known police magistrate dismissed a summons in a much more serious case (where there was not only deficiency of camphor, but no olive oil) on the ground that the B.P. applies only to chemists. In a certain town a chemist was fined for selling Gregory's powder in which the magnesia had been apparently partly replaced by carbonate; while in another instance, in which the magnesia had been wholly replaced by carbonate, the judge dismissed the case as no detriment to the purchaser had been proved. In some cases men who have sold sweet spirits of nitre not of B.P. strength, have been excused on evidence that they sold the preparation of the old London Pharmacopœia, and that their customers were satisfied with it; but that plea has not always availed.

Quite recently a chemist was sharply fined for selling green belladonna plasters which do not conform to the B.P. *emplastrum belladonnæ*, and that notwithstanding the fact that it was distinctly stated on the label that they were not made with the B.P. preparation and were of less alkaloidal strength. The same report mentions that a tradesman was fined for selling seidlitz powders not of the quality prescribed by Act of Parliament. It would be interesting to know which Act of Parliament defines the composition of seidlitz powders. The prosecutions based on defective spirit of nitrous ether have been numberless, but in only a few cases has there been sufficient ground for a prosecution. The respectable chemist does not deliberately deteriorate his preparations or add water to them, though some of the prosecuting

authorities seem to think so. Some analysts do not know how to use the nitrometer.

I remember a case of that kind where a well-known Ph.D. proved for the defence that the spirit was quite up to strength. We waited with interest to hear what Somerset House had to say, but Somerset House would say nothing, because the official sample had arrived in a half-full bottle and leaking through the cork. There was a run for a while on "glycerin and lime-juice." In one case the prosecutor stated that the preparation undoubtedly came within the Act because "glycerin was mentioned in the Pharmacopœia." I am not aware that a more inclusive interpretation of the Pharmacopœia as a standard has yet been given. Some men were fined because the preparation contained no glycerin, others because it contained no lime-juice. In one instance there was an appeal to Somerset House, where they had no difficulty in finding the glycerin. The magistrates seemed sorry they could not convict, but let the analyst down lightly by declaring that he must have got the top of the bottle and Somerset House the bottom. Although it has been proved that in some parts of the country "magnesia" means popularly the basic carbonate, it has been held to be illegal to sell it under that name, because B.P. does not allow it.

It seems to me that what is wanted is not so much an amended Act as a more intelligent and reasonable interpretation of existing laws. In Scotland there are cases in which local authorities do not prosecute without first communicating with the Crown Office, in order to get the Lord Advocate's concurrence. It would be a great improvement if inspectors and such like could not proceed against a chemist until some competent central authority had decided that there was a *prima facie* case and sufficient ground for proceeding. The Government Laboratory would often be a useful help in deciding, though it may not be infallible. Any way, it is clear that the application of the Pharmacopœia as a standard cannot be properly effected by many of the existing inferior officials.

The PRESIDENT, in inviting discussion, said, as far as analysts were concerned, it seemed a hard matter to ask them to carry out the provisions of the Food and Drugs Act when there was no standard by which they could carry them out.

Mr. GLYN-JONES said no doubt all would admit that the B.P. as a legal standard could hardly be said to exist. There was, so far as he knew, but one Act of Parliament which referred to the B.P. as a standard, and that was the Pharmacy Act of 1868, Section 15,

and that had never been enforced. Although there was no statute which said that the B.P. was the legal standard, it was now well known that it was accepted as such by all the authorities and public analysts for medical prescriptions and for household medicines. This recognition of the Pharmacopœia was the result very largely of the efforts of the Medical Council. Dr. Attfield's reports in 1890 and 1891 on the Pharmacopœia contained remarks congratulatory of the fact that the authorities had recognised that the B.P. was the standard for articles which were sold as medicine. He (Mr. Glyn-Jones) thought the compilers of the Pharmacopœia in seeking those powers should have first of all taken care that they were in a position to provide a satisfactory standard. For the past two or three years the transactions at the Conference meetings had clearly shown that the B.P. was not satisfactorily compiled as a standard by which a man should be judged in a court of law upon those articles of medicine which they themselves wished it should be the standard for. In the preface to the Pharmacopœia it was stated that it was intended to afford to the medical profession and those engaged in the profession of medicine one uniform standard and guide whereby the nature and composition of substances used in medicines might be ascertained. Now, if he were taken into Court and had Dr. Attfield standing by his side to explain that that preface did not mean what it said, of course he would be all right; but how could he dare to tell the magistrate that the Pharmacopœia standards were not perfect? He would not say that the Pharmacopœia should not be the legal standard for those articles, but he did say that it amounted to a disgrace that a book of the kind which it was said they should be judged by, should be admitted to be faulty. Dr. Attfield said they seemed to forget that there were hundreds of workers behind the Pharmacopœia who were working on these tests; and it was said that it would cost £20,000 to put it in proper condition. Even if that were so he, as a retail chemist, said if the Government wanted to judge him by it, they must spend the £20,000 on it in order to perfect it. He went further than that, and said when they were prepared to provide a proper standard whereby he might submit to be judged, the Government should see that everything was done to make it as perfect as possible, and when they did that they should put the preparation of it in the right hands, and, however much respect he had for the General Medical Council, in his opinion that body ought not to have the sole control of a book which was to be the standard of

saltpetre, for instance, when he sold it across the counter. As pharmacists they had a right to claim that they should be consulted in the preparation of the Pharmacopœia, and also that they should be remunerated for the work which they did in providing the country with an efficient standard. The preface said that it was only to be used for articles used in medicine; but he wished, when the synonyms had been selected, that that had been kept rigidly in front of those who selected them. Was it fair that they should have in the B.P. such synonyms as "saltpetre" and "nitre"? According to the Pharmacopæia, saltpetre was that which should give no trace of soda. Dr. Attfield would say that there were saltpetres and saltpetres, and that if saltpetre for medicine was wanted, then they must sell the B.P. article; but he (Mr. Glyn-Jones) wanted to know what he, as a chemist, must sell when a pound of saltpetre was wanted for making fireworks, or for salting bacon. This was a very important point to chemists. Some two or three years ago a grocer was prosecuted because his beeswax contained fifty per cent. of paraffin. What was the defence? That beeswax was not a drug, although it was in the B.P., and that it could not be a drug because it was sold by a grocer. The magistrates upheld this view; but, what was worse, the case was taken to the High Court, where the magistrates' decision was upheld, and the Judges of the High Court said, if they said anything, that when a chemist sold beeswax he must sell it without paraffin wax, but that his competitor down the street could sell it with as much paraffin wax in it as he liked, and at any price he liked. Was this a matter that chemists could look upon unconcerned? Then to take the question of tinctures; a chemist was summoned because his tincture of opium did not come up to what the analyst said was the B.P. standard The chemist had to go down to the Court to teach the analyst, at whose instance the prosecution was launched, his duty. But that was only done at the expense of the chemist, for, although the case was dismissed, he had to pay his own costs. This was a thing which chemists could not afford to do. It was the duty of the authorities to provide a standard. Then with regard to spirit of nitre; could, in a book which was said to be practically a standard, such a phrase as this be permitted—when it was freshly prepared it should be of one strength, but that after the bottle had been "occasionally" opened it should be of a lesser strength? How was the magistrate to know what to do? Were the public to get only spirit of nitre freshly prepared, or an

article which had been taken out of a bottle which had been "occasionally opened?" The use of the word "occasionally" in connection with something which was to be taken into Court was wholly unjustifiable. Then, again, had retail chemists a right to expect that when their wholesale house sent them spirit of nitre they should send them something which was freshly prepared, and which contained seven volumes, or something which had been opened two or three times, and which contained five volumes? In conclusion, he urged that it was the duty of chemists not to be satisfied with the present standards in the Pharmacopœia, which were gradually being enforced against them, but that they should insist that the Government, through the Medical Council and the Privy Council, should see that there should be an efficient book of standards, if they were to be judged as to the merits of the articles they sold.

Mr. HOWARD thought the scope of the paper might be divided into two parts. The title of the paper on the programme was "The British Pharmacopœia as a Standard for Articles of Commerce," and this opened up a very much wider range than the question of substances sold retail over the counter as medicine. He thought the preface of the Pharmacopœia ought to contain an authoritative statement as to how far and under what Acts that Pharmacopœia was a standard, because he agreed with Mr. Glyn-Jones that it was no use for a defendant in a case to go into Court and say that Dr. Attfield had said to the Pharmaceutical Conference that the Pharmacopœia was not a standard under the Food and Drugs Act. The thing that was required was for a defendant or prosecutor to be able to go into court and be able to hand up the Pharmacopœia to the magistrate and say, "If you look at page so-and-so you will see whether this book is or is not a standard to be applied in this particular case." As applied to articles of commerce, whatever might be the opinion with regard to articles used as medicine, it was clear that it was perfectly impracticable that the Pharmacopœia should be a standard. There was no doubt that if the Pharmacopœia was taken as a standard some 19-20ths of the sales of cinchona would be illegal, for the greater part of the bark used in manufacturing was not C. succirubra, and a large proportion of the *Chinchona succirubra* contained a different proportion of the alkaloids to that allowed by the B.P. It was the same with opium and other drugs. If someone bought washing soda to scrub the floors with, it was only right that he should have a proper soda, but he did not want the B.P. soda, and it was not fair that he

should be called upon to pay for it. He agreed with the suggestion that it would be very desirable before prosecutions were instituted, where points were in dispute, that the ground of the prosecution should be submitted to some central authority, and that where the prosecution was proceeded with it should be left in the hands of the Public Prosecutor, as was done in other and more serious matters.

Mr. Rutherford Hill said it was a vexed question whether the Pharmacopœia was a legal standard under the Food and Drugs Act or not. In his opinion it was impossible to escape from the conclusion that it was. A vendor was prosecuted for selling laudanum which was not of the nature and quality demanded. Then the question came before the Court: Was there in the British Statute Book an official definition of laudanum? When that inquiry was prosecuted it was immediately found that under the Pharmacy Act of 1868 there was in the British Statute Book a statutory definition of laudanum. The moment that fact had been reached, unless the Food and Drugs Act expressly excluded the Pharmacopœia as a legal standard, it was inevitably the legal standard. He submitted that the Court had no option but to adopt it as a standard. In the compilation of the Pharmacopœia this difficulty might to some extent be avoided. The phraseology adopted for bruised linseed has been so adjusted as to eliminate the possibility of the Pharmacopœia being a standard for what was sold as linseed meal. It was said that the public should be familiarised with the use of the letters "B.P." With regard to cream of tartar, for instance, it was absurd to insist that all cream of tartar should come up to the very high standard that was aimed at in a Pharmacopœia meant only for an article used in medical practice. The extended use of the letters "B.P." by chemists would educate the public, very much to the advantage of the chemist; they would come to the chemist when they wanted a good article, and they would go to the grocer when they wanted an inferior article. The only proper place for a standard for commercial drugs was in a schedule to the Sale of Food and Drugs Act, and it should be drawn up by the Government with the assistance of Somerset House.

Mr. Wippell Gadd said it seemed a pity that that meeting of pharmacists should let it go forth that they repudiated the Pharmacopœia. He thought pharmacists as a rule were quite satisfied to adopt the Pharmacopœia as their standard, although they were aware that there were inconsistencies and mistakes in it. That

seemed to him the right position to take—to point out mistakes where they found them, but not to repudiate the Pharmacopœia as the standard. He could not understand pharmacists objecting to a judge differentiating between them and grocers. There were only two courses open to a conscientious pharmacist—either to buy his own drugs and make his preparations himself, or to get the finished products from a manufacturer, assuring himself, either by an examination or the statement of the maker, that the finished product was what it should be. Anyone could calculate approximately what the standard ought to be. He thought the question of deterioration had been pushed a little too far. No wholesale house would send out spirit of nitre at the weakest possible strength; they would rather send it out a little stronger than the maximum strength, so as to allow for the retailer keeping it a little time. It was said that in the case of ipecacuanha wine the alkaloids deteriorated or altered in character, and that an estimation made after an interval of three months would give a very different result. He could not contradict that statement, though he believed it had been contradicted, and some short time ago he put aside preparations of ipecacuanha and a tincture of cinchona. The results reached him the previous day by telegraph; they were practically identical with the results obtained three months ago. With regard to popular articles like limejuice and glycerin, it was not to the interest of the pharmacist to perpetuate misnomers. No one, as far as he knew, expected to find limejuice in that article, and it was much better to alter the name and instruct the public accordingly.

Dr. Symes said it would be a misfortune if it went forth that the Conference wished to adopt some lower standard than the Pharmacopœia, or not to recognise it. But he thought Mr. Gadd was a little unfortunate in his suggestions. The title of the paper was the B.P. as a Standard for Articles of Commerce, and Mr. Gadd rather referred to articles of pharmacy. The author rightly complained of the injustice of applying the "B.P." to cases where it should not be applied, and the paper would have been perhaps suitable to a meeting of county justices. Still, it was a serious matter to have a condition of things whereby a man who desires to carry on his business respectably and honestly might be hailed before a magistrate, and some imaginary standard should be adopted which might do him immense injury, because, of the thousands who read of his being summoned, only a few hundreds might read of the charge being dismissed, even if that were the result. Mr.

Glyn-Jones was therefore quite right in saying that if it cost £20,000 to make the position clear, as to the standards of purity of drugs, it ought to be done. The Conference had always upheld the purity and quality of medicines, and desired to do so, but that was very different to applying the B.P. as a standard for general articles of commerce. It must also be remembered that in many cases in the country the business of the chemist was almost entirely confined to the selling of commercial articles.

Dr. ATTFIELD said he had not much to say, because this paper did not concern him much as the Editor of the Pharmacopœia, though it did concern him a little as Reporter to the Medical Council respecting pharmacy in relation to the Pharmacopœia. They must carefully distinguish between what the Reporter to the Medical Council might say respecting household medicines, and what the compilers of the Pharmacopœia, and even the Editor, might think about what the Reporter reported respecting household medicines. During the whole of his connection with the Pharmacopœia he had endeavoured to be absolutely loyal to pharmacy, and to show to the Medical Council what the pharmacists' views were in relation, not only to the Pharmacopœia, but to the sale of household medicines, and the Medical Council had never discouraged him doing so. That was one thing, but it was quite another thing to assume that the Medical Council would be influenced by what he said with respect to the relation of pharmacists to household medicines. The Pharmacopœia, whether the British, or the London, Edinburgh, or Dublin Pharmacopœia, whatever special pleaders might say, was produced as the book which would enable medical men to prescribe with certainty and pharmacists to carry out their wishes, and nowadays there was no difference—the Pharmacopœia was still what it always was, a guide to the prescriber and pharmacist. As to any relation it might have to the Sale of Food and Drugs Act, it was quite clear the Medical Council had nothing whatever to do with it, because that Act was much later. He did not say the Medical Council were opposed to anything they might suggest with regard to the question of a standard for the sale of drugs to the public, but he did not say they would approve of it; it was not their business. Those responsible for the production of the Pharmacopœia had never sought for powers to set up standards, satisfactory or unsatisfactory, for household medicines.

Mr. GLYN-JONES said the description Dr. Attfield had given of the Pharmacopœia was hardly applicable to some of the synonyms

which were contained in it, such as saltpetre and spirits of sal volatile; he did not suppose a physician ever prescribed those articles.

Dr. ATTFIELD said there were a few synonyms put in at the wish of various parties, which, now that the matter was looked at more seriously, might perhaps, with advantage, be omitted. In 1885 there was a strong current of opinion amongst pharmacists in favour of the insertion of scores and hundreds of synonyms, which he opposed. Now the current seemed to be setting in the opposite direction. Much was to be said for and against the official recognition of synonyms. The question was almost wholly one for pharmacists to discuss and agree upon.

Dr. COULL thought if the Editor of the Pharmacopœia had not intended to take the thing up seriously, he should not have taken it up at all. As a chemist to a wholesale firm he would not like to see such synonyms as laudanum, paregoric, or camphorated oil deleted, because the inclusion of these articles, which were perfectly defined by chemical tests of easy application by an ordinary pharmacist, protected the retail druggist when he had to enter into competition with the stores.

The PRESIDENT said he should support the last speaker so long as the synonyms referred only to substances used in medicine, but when they were used for other purposes, it seemed to him the synonyms would be far better left out.

Mr. MOOR said the author of the paper seemed to object to the Pharmacopœia being applied by analysts in an oppressive manner to judge of articles of commerce not intended for use in medicine. He should like to know what such articles were. He could hardly think of any article of commerce which had been attacked to any extent, and condemned ruthlessly by the Pharmacopœia definition. All honest traders would desire to have the protection which the B.P. gave them, if it were not so variable, the analyst being able to adopt whatever tests he thought right, thereby getting from twenty-five to thirty or forty per cent. difference between one analysis and another. If these tests were made definite, and if the Government would spend a little money and pay the workers, instead of snipping up little pieces of information for nothing out of the American and German Pharmacopœias, and the "Year-Book" and Journals, then pasting them together and sending them out as a book on which prosecutions were based, though no experimental work had been done to prove the accuracy or otherwise of the results, there would be less cause for complaint. It was

generally agreed that the next Pharmacopœia was likely to be more definite, and he hoped everyone would do all they could to make the tests more definite and accurate than they were at present.

Mr. G. C. Druce said he felt in a somewhat anomalous position in speaking on this subject, because he was chairman of a sanitary authority, and sometimes had brought before him certain articles which apparently were not what they were represented to be. Magnesia had been the subject of a considerable number of prosecutions, and in his own neighbourhood, recently, an active inspector had been about collecting a large variety of samples, all elegantly put up and properly labelled, usually "magnesia," but sometimes "carbonate of magnesia." All, with one exception, contained carbonate of magnesia, and the question was raised, should there be a prosecution? He said, No; because he felt convinced that the person who asked for it did not mean light magnesia, or heavy magnesia, but what he was accustomed to call magnesia, which was the carbonate. That was the common-sense view, and, as a rule, he did not think public analysts were unduly severe. He should be very sorry to see all the synonyms deleted, because they were useful, and he could not see why beeswax, when sold by a chemist for polishing a floor, should differ in constitution from beeswax sold for the same purpose by a grocer.

Mr. Walter Hills thought that one thing to be learned from the discussion was that the more closely they got into contact with medical men in preparing the Pharmacopœia, so much better would be the result. Until the time came, when by an Act of the Legislature, pharmacy took its right position of working co-ordinately with medical men, they must do the best that was possible under existing conditions. He must confess he feared it would be a good while before pharmacists occupied that position to which, in his opinion, they were entitled. Still, he thought they were on the right tack at present. There was now a Conference consisting of members of the General Medical Council, experts in pharmaceutical matters, and three pharmacists, forming an almost ideal combination for deliberation. They did not want medical and pharmaceutical committees sitting separately, with messages passing between them, but representatives of each calling meeting and deliberating round one table, and that was the present arrangement. There was work before them which would take some years; and, although the £20,000 might not be forthcoming, progress was already being made and much useful work would doubtless be done. When the

next Pharmacopœia appeared there would, probably, be less ground for criticisms on the reliability of tests and other matters of detail.

Dr. McWalter said it was very improbable, if not impossible, that the public would ever be got to say that they wanted an article of less purity when one of greater purity could be obtained. They must put up with the B.P. as a standard, whether it was originally intended as such or not. Some part of the difficulty might be got over by greater care being used in the terms of descriptions. Take cream of tartar; if any person asked for purified cream of tartar, he was bound to get an article containing 98 per cent. of bi-tartrate of potassium, but the person asking for cream of tartar was not bound to do so. If the same thing were done with regard to nitrate of potash, and if some synonyms were left out, it would be a great improvement. If a person asked for purified saltpetre, there should be a certain defined substance given him, and, of course, when anything was written in Latin in a prescription the B.P. article only should be given. Another article he might refer to was belladonna plaster. It was very proper when a medical man ordered belladonna plaster that he should have a rather potent drug supplied, and the ordinary belladonna plaster containing half per cent. of total alkaloid was quite satisfactory. But many cases of belladonna poisoning had come under his observation, and it was undoubtedly a danger to the public to be always supplied with a plaster containing a half per cent. of alkaloid. He had known a person laid up for months from this cause. If the ordinary plaster sold contained a small portion of belladonna it did not matter, and although you might say it was not right to sell a plaster which was almost worthless, at the same time it was better to sell a plaster which was almost worthless than to run the risk of doing an injury. The emplastrum belladonnæ B.P. should be defined as brown belladonna plaster, and supplied when the physician ordered it, but when the public asked for belladonna plaster they were not bound to get the same thing.

A hearty vote of thanks was passed to Mr. Dott for his paper.

Owing to the lateness of the hour, and the protracted but exceptionally interesting discussions which had followed the reading of the papers, the President much regretted that the remaining communications, which were of considerable value, must be taken as read. Although the authors were absent, the cordial thanks of the Conference were due to them individually for their respective contributions.

ASAFETIDA PREPARATA.

By Hy. Williams Jones.

Having had occasion to prepare purified asafetida, I tried alternate treatment with alcohol and water to separate earthy matter and other insoluble impurities of the gum-resin.

As the recovery of the gum and resin involved evaporation of the solvents, and consequent loss of essential oil, I tried a method of precipitation.

This gave the resins of the drug with by far the major portion of the essential oil, and eliminated the gummy portion.

The sample submitted to the British Pharmaceutical Conference was prepared by treating one part of undried asafetida with five fluid parts of alcohol (90 per cent.) in a closed jar in a water bath, and solution effected by the aid of a little heat. The liquid portion was filtered off when cold and poured into ten times its bulk of water faintly acidulated with hydrochloric acid. After standing for twenty-four hours the precipitated mass, consisting of resins and essential oil, was collected on a calico filter, washed with water, scraped off into a shallow dish, and exposed to the air for a few days to allow of the evaporation of a small quantity of water appearing on the surface.

The possible use of asafetida so prepared would be for pill masses in place of the powder, and it might also be used for the easy preparation of the tincture, in which case the use of rectified spirit, in place of the weaker alcohol now ordered, would, in my opinion, be a distinct advantage.

MERCUROUS IODIDE.

By Frederick B. Power, Ph.D.

Although mercurous iodide is not recognised by the British Pharmacopœia, it is considerably used in this country, and has recently been brought somewhat more prominently to notice by a suggestion from a committee of Canadian pharmacists that the pure yellow iodide, obtained by the interaction of mercurous nitrate and potassium iodide, should be included in the Indian and Colonial Addendum of the Pharmacopœia (*Chemist and Druggist*, September, 1899, p. 448). The preparation recommended by the Committee is therefore that which was adopted by the U.S. Pharmacopœia of 1890, under the title of hydrargyri iodidum flavum, but which

had really been introduced into medicine some time previously by a New York firm of manufacturing chemists.

The method for the preparation of a pure precipitated mercurous iodide was proposed by Henry Maclagan in 1883 (*Proc. Amer. Pharm. Assoc.*, 1883, p. 209). He regarded the process then official in the United States and most of the other pharmacopœias, by triturating together mercury and iodine, as objectionable, particularly because of the invariable formation of red iodide, and the difficulty of removing the latter. Another more complete paper on the same subject was published by Maclagan in 1884 (*Proc. Amer. Pharm. Assoc.*, 1884, p. 442), in which he gave analyses of the pure and commercial iodide, proving that pure mercurous iodide has a bright yellow colour, and also disproving the existence of the so-called mercuroso-mercuric iodide. The fact that pure mercurous iodide, both in its crystallised and in its amorphous form, has a yellow colour, was likewise definitely established by A. Stroman, *Ber. d. deutsch. chem. Ges.*, 20, 1887, p. 2818 (see also *Pharm. Journ.*, January, 1898, p. 87). Further proof of the non-existence of a mercuroso-mercuric iodide, Hg_4I_6, which was first announced by Boullay, and has been stated by Schlagdenhauffen (*Amer. Journ. Pharm.*, 1877, p. 598) to be contained in ordinary mercurous iodide, when prepared either by trituration or precipitation, has recently been afforded by Francois (*Pharm. Journ.*, January, 1898, p. 68), who shows that the supposed compound is simply a mixture of the two iodides.

Edward Soetje (*Proc. Amer. Pharm. Assoc.*, 1888, p. 167) has also given a process for the preparation of pure mercurous iodide, but which was essentially the same as that proposed by Maclagan and adopted by the U.S. Pharmacopœia. He washed the product only with water, and not finally with alcohol, as directed by the latter work, which does not seem to be necessary.

Ten years ago Messrs. William Martindale and W. H. Salter presented a paper to the Conference on the subject of "Hydrargyri Iodidum Viride for Medicinal Use" (*Pharm. Journ.*, September, 1890, p. 259), which was followed by quite an extended discussion. In this paper they refer to the accepted instability of the preparation formerly official in the British and German Pharmacopœias, and state:—"As there is still a considerable demand for it for medicinal use, our object has been to ascertain how far this stigma is deserved, and, if possible, to find a remedy for it." In commenting on a method proposed by Lefort (*Pharm. Journ.*, 1873, p. 823) for the preparation of mercurous iodide by precipitating a solution

of mercurous acetate with potassium iodide in the presence of sodium pyrophosphate, the authors remark:—"We have not tried this process, because we have understood the product to be unstable; *it is, we fear, too pure to be stable.*"

Messrs. Martindale and Salter then consider that the difficulties experienced with this preparation may be best overcome by the use of a large excess of mercury, and they suggested a method for making a green iodide of mercury by the old process of trituration, but with the use of 25 per cent. more mercury than is theoretically required, so that about 13·2 per cent. of free mercury is contained in the finished product. The authors then arrive at the following general conclusions:—"The samples are not pure. If the preparations were again made official this could be recognised. But we hold that a green iodide of mercury can be so prepared, and with reasonable care it can be kept sufficiently stable and uniform in appearance for use in medicine. The instability of this preparation, we think, has been overestimated, as the amount of mercuric or red iodide found in the worst sample examined is insignificant, and we therefore consider that it has been condemned without just cause, as the dose, 1 to 3 grains, in the last (1867) B.P. was misleading and much too large, $\frac{1}{6}$ to $\frac{1}{2}$ grain being the dose usually given, and generally with good results. It is mild in action, and as a useful remedy we feel sure it will continue to be prescribed."

As previously stated, a pure, yellow mercurous iodide has been officially recognised by the U.S. Pharmacopœia since the 1890 revision, and in the meantime has been made on a large scale by chemical manufacturers and extensively employed in medical practice. So far as known to the writer, no observation has been recorded during this period as to its instability when properly kept, nor of any untoward effects resulting from its use. In connection with these facts it was thought of interest at this time to obtain specimens of yellow mercurous iodide from some of the leading American manufacturers and to examine them for their purity, as they would represent products that have been kept for indefinite periods, and such as are constantly being supplied for medicinal use. In addition to these, analyses were made of a sample of mercurous iodide prepared by the writer according to the U.S. Pharmacopœia method, the product, however, being only washed with water, and of a sample made by the same method on a larger scale. For the purpose of comparison preparations were also made, by the process of trituration, according to the methods

of the German Pharmacopœia Supplement, the French Codex, and the formula proposed by Messrs. Martindale and Salter.

Having ascertained that all the preparations were quite free from mercuric iodide, the amount of iodine or pure mercurous iodide contained in them was determined by the method employed by Messrs. Martindale and Salter, which was found to give accurate results.

About 0·5 to 0·8 gm. of the salt was accurately weighed into a small flask, and 5 gm. of pure granulated zinc and 10 c.c. of 36 per cent. acetic acid added. The flask was heated on a water-bath, and the liquid agitated occasionally until all the mercurous iodide had dissolved, which usually required about twenty minutes. The contents of the flask were then washed into a beaker, and a slight excess of silver nitrate solution added, together with about 1 c.c. of pure nitric acid, diluted with a little water. The liquid was then heated to boiling for a few minutes, and after the precipitate had completely subsided it was filtered off, washed, dried, and ignited.

The atomic weights employed in the calculations were as follows: Hg = 200·3; Ag = 107·93; I = 126·85.

The specimens examined may be designated as follows:—

(1) Prepared by the writer, according to the method of the U.S. Pharmacopœia, 1890.

(2) Prepared on a larger scale by the same method, and kept for over six months.

(3), (4), (5), (6). Specimens of yellow mercurous iodide obtained in original sealed packages from manufacturers in New York, Philadelphia, and St. Louis.

(7) Prepared, by trituration, according to the German Pharmacopœia Supplement. The proportions directed are 10 parts of iodine to 16 parts of mercury, the theoretical proportions for mercurous iodide being 10 parts of iodine to 15·79 parts of mercury. The Swiss Pharmacopœia also adopts the proportions of 10 to 16.

(8) Prepared, by trituration, according to the French Codex, but without extracting the product with boiling alcohol. The proportions directed are 10 parts of iodine to 16·66 parts of mercury.

(9) Prepared, by trituration, according to the method of Messrs. Martindale and Salter, with the proportions of 10 parts of iodine to 19·67 parts of mercury. This preparation is of a decidedly greenish colour, that of the French Codex being also greenish, while the German is described as greenish-yellow, but is really a dull yellow. The intensity of the green colour is naturally dependent upon the relative proportions or excess of mercury employed.

The following table presents a résumé of the analytical results obtained :—

No.	Weight of Salt Taken.	Weight of AgI Found.	Percentage of Iodine.	Percentage of Hg_2I_2.
			Calculated for Hg_2I_2 38·77.	
(1)	0·8478	0·6102	38·88	
(2)	0·6646	0·4708	38·27	
(3)	0·5514	0·3902	38·23	
(4)	0·5056	0·3588	38·34	
(5)	0·5282	0·3862	39·50	
(6)	0·4856	0·3438	38·25	
(7)	0·6446	0·4484	37·58	96·92
(8)	0·8884	0·6024	36·63	94·47
(9)	0·6238	0·3788	32·80	84·60

When tested according to the U.S. Pharmacopœia for mercuric iodide all the commercial samples, as well as the other preparations, were found to be quite free from this contamination, with the single exception of No. 5, which contained slight traces of it. This specimen was contained in a white glass bottle, and had apparently become somewhat altered by exposure.

These results indicate that precipitated mercurous iodide is quite uniform in composition, and also sufficiently stable when properly protected. The evidence that has thus far been obtained from its therapeutic use is also of a satisfactory character. It is naturally for the therapeutist to decide whether a mercurous iodide containing more or less free mercury is preferable to the pure salt for medicinal use, but the facts now available would appear to thoroughly justify the suggestion of the Canadian committee that the pure yellow iodide should be adopted in the proposed Indian and Colonial Addendum of the Pharmacopœia.

THE COMPOSITION OF BERBERINE PHOSPHATE.

By Frank Shedden, B.Sc., A.I.C.

Having had occasion to prepare several sorts of berberine, including the phosphate, and as some uncertainty seems to have prevailed regarding the composition of the latter, Dr. Power suggested to me that I undertake an investigation of the subject.

The history of berberine phosphate has been given by Lloyd,[1]

[1] *Drugs and Medicines of North America*, vol. i. p. 122.

who states that a substance was introduced into commerce under this name by Dr. T. L. A. Greve[1] about the year 1877. The substance prepared by Dr. Greve by the treatment of mono-berberine sulphate with precipitated calcium phosphate was proved, however, by Parsons and Wrampelmeier in 1878 to contain no phosphoric acid, and to consist of di-berberine sulphate.

Lloyd[2] described the preparation of the salt from berberine and phosphoric acid, and stated its solubility, as determined by Mr. Lord to be 1 part in 280 parts of water.

Parsons and Wrampelmeier[3] prepared the salt by heating together mono-berberine sulphate and acid calcium phosphate, $Ca H_4 (P O_4)_2$, evaporating nearly to dryness, extracting with hot diluted alcohol, again evaporating nearly to dryness, and treating with cold stronger alcohol. In the abstract of their paper (*loc. cit.*) it does not appear that the product thus obtained was examined for calcium, an impurity which is likely to occur, as will be shown later. From their analysis, apparently of the recrystallised salt, they were led to adopt the formula $C_{20} H_{17} N O_4 \cdot 7 H_3 P O_4 + 4 H_2 O$[4].

Wilmarth[5] prepared a berberine phosphate by exhausting the powdered root of *Hydrastis canadensis* with water, evaporating, extracting with alcohol, again evaporating, and treating the aqueous solution of this residue with a large excess of dilute phosphoric acid. The crystals which separated from the concentrated liquid on standing were washed free from acid with 94 per cent. alcohol, and recrystallised from hot alcohol of the same strength. Parsons analysed this salt, and assigned to it the formula $C_{20} H_{17} N O_4 \cdot 2 H_3 P O_4$.

Schmidt (*Pharm. Chemie*, 3rd edit., bd. ii., p. 1323) gives the formula $(C_{20} H_{17} N O_4)_3 (H_3 P O_4)_2 + 5 H_2 O$ for a berberine phosphate, which is stated to be prepared by adding to powdered berberine in hot water sufficient phosphoric acid to render the

[1] *Eclectic Medical Journal*, Cincinnati, 1877, p. 311.
[2] *Proc. Amer. Pharm. Assoc.*, 1878, p. 802.
[3] *Ibidem*, 1879, p. 514.
[4] In explanation of this formula, Parsons and Wrampelmeier remarked as follows:—"This formula seems, at first sight, an improbable one, but any person who will take the pains to look up the formulæ for the phosphates of the other alkaloids will be surprised at their lack of uniformity, and at the fact that alkaloids exhibit no particular quantivalence." Lloyd's *Drugs and Medicines of North America*, vol. i. p. 124. Dr. Power in *Contributions from the Department of Pharmacy of the University of Wisconsin*, 1885, No. 1, p. 52, remarked concerning the above formula: "Some experiments made by me with a phosphate of berberine prepared by Professor Lloyd, gave results which would lead to a very different formula for this salt, and which will be reported on at a later date."
[5] *Proc. Amer. Pharm. Assoc.*, 1879, p. 515.

liquid slightly acid, concentrating, and precipitating the salt with alcohol. I have not been able to refer to any published analytical data relating to this formula.

In Lloyd's *Drugs and Medicines of North America*, 1885, p. 124, it is noted that the previously mentioned analysis by Parsons and Wrampelmeier being the only one known to them at that time of a compound of berberine and phosphoric acid, it seemed desirable to add further information to the subject. Accordingly, Prof. Virgil Coblentz was requested to undertake some analyses of the compound. Coblentz proceeded by dissolving a given weight of pure berberine in absolute alcohol, adding a known quantity of phosphoric acid, sufficient to ensure an excess, treating the alcoholic solution with absolute ether, filtering off the precipitate, and estimating the phosphoric acid in the filtrate. By this indirect method of estimating the combined phosphoric acid, which was conducted both gravimetrically and volumetrically, Coblentz arrived at the conclusion that the formula for the salt must be $C_{20}H_{17}NO_4 \cdot 7H_3PO_4$.

For my own investigation of the composition of berberine phosphate the salt was prepared by the interaction of berberine acetone (a compound which is easily obtained pure) with an excess of phosphoric acid, and recrystallising the product.

The salt thus prepared was of a bright yellow colour. It did not increase in weight even in a damp atmosphere.[1] The crystallised salt is soluble in 14·3 parts of water at 16° C., the dehydrated salt in 15 parts of water at 15° to 16° C.

The analysis of this salt was conducted as follows :—

(*a*) The water of crystallisation was determined by heating to 110° C. until of constant weight.

(*b*) For the determination of the phosphoric acid a weighed quantity of the salt was treated in a conical flask with about 5 c.c. of pure sulphuric acid, powdered potassium nitrate added, and the flask gently heated. After cooling, more potassium nitrate was added, and the liquid again heated until it was colourless, or only pale yellow, and the red fumes had disappeared. It was then diluted with water, boiled, and made alkaline with ammonia. The phosphoric acid was determined in this liquid by precipitating with magnesia mixture in the usual way.

(*c*) The base was determined by dissolving a known weight of

[1] Parsons and Wrampelmeier note that the salt obtained by them by the use of acid calcium phosphate readily absorbed water, but not so readily when re-crystallised.

the salt in hot water, adding a slight excess of hydrochloric acid, and then an excess of solution of platinic chloride, equal to about twice the amount required to form the platinum double salt. The liquid containing the precipitate was evaporated to a small bulk on a water-bath, alcohol added, and the precipitate thoroughly washed with alcohol, first by decantation and then on a filter. It was then finally ignited until of constant weight.

(1) 0·7083 gramme of the salt lost 0·0340 gramme at 110° C., corresponding to 4·80 per cent. of water, and gave 0·2818 gramme $Mg_2 P_2 O_7$, corresponding to 0·2481 gramme, or 35·03 per cent. $H_3 P O_4$.

(2) 0·7370 gramme of the salt lost 0·0360 gramme at 110° C., corresponding to 4·88 per cent. of water, and gave 0·2988 gramme $Mg_2 P_2 O_7$, corresponding to 0·2631 gramme, or 35·70 per cent. $H_3 P O_4$.

(3) 0·2268 gramme of the salt gave 0·0392 gramme of platinum corresponding to 0·1348 gramme, or 59·43 per cent. of berberine.

(4) 0·1868 gramme of the salt gave 0·0326 gramme of platinum, corresponding to 0·1121 gramme, or 60·01 per cent. of berberine.

These results may be tabulated as follows :—

		(1)	(2)	(3)	(4)	Calculated for $C_{20} H_{17} N O_4 \cdot 2 H_3 P O_4 + 1\frac{1}{2} H_2 O$
$H_2 O$	=	4·80	4·88	—	—	4·83 per cent.
$H_3 P O_4$	=	35·03	35·70	—	—	35·13 ,,
$C_{20} H_{17} N O_4$	=	—	—	59·43	60·01	60·04 ,,
						100·00

Some experiments were made to ascertain whether the base could be accurately estimated by means of the crystalline chloroform compound, $C_{20} H_{17} N O_4 \cdot C H Cl_3$. For this purpose a weighed portion of berberine phosphate was dissolved in water, an excess of soda added, and the base extracted by shaking out with chloroform. The chloroform solution was evaporated, and the residue, when dry, heated in a water oven till of constant weight. Similar experiments were made with berberine nitrate and sulphate, but in no case were concordant results obtainable by this method, the difference being as much as 1 per cent.

It was now thought of interest to prepare some berberine phosphate according to the method described by Parsons and Wrampelmeier (*loc. cit.*). After the removal of the product, and allowing the mixed mother liquor and alcoholic washings to stand over night, a precipitate separated out. On filtering this off it was found to be quite white, and to consist of calcium phosphate with traces of sulphate.

The berberine phosphate thus obtained was of a bright yellow colour, and did not absorb water when exposed to the air, but darkened slightly at 110° C. It contained some calcium, and on recrystallising from alcohol left about 5 per cent. of a white residue consisting of calcium phosphate and sulphate. The recrystallised salt was in the form of bright yellow, silky needles, and was free from calcium and sulphates. Analyses were made of the salt both before and after recrystallisation.

The salt containing calcium was treated with sulphuric acid and potassium nitrate as before described, the liquid diluted, made alkaline with ammonia, and acidified with acetic acid. The calcium was then estimated by precipitation with ammonium oxalate in the usual way.

0·8090 gramme of the salt lost 0·0272 gramme at 110° C., corresponding to 3·36 per cent. of water. The same quantity gave 0·0294 gramme $CaCO_3$ = 0·0117 gramme Ca, or 1·45 per cent. Ca., and also gave 0·4011 gramme $Mg_2P_2O_7$ = 0·3532 gramme H_3PO_4, or 43·66 per cent. H_3PO_4.

0·8618 gramme of the salt lost 0·0290 gramme at 110° C., corresponding to 3·36 per cent. of water. The same quantity gave 0·0374 gramme $CaCO_3$ = 0·0149 gramme Ca, or 1·74 per cent. Ca, and also gave 0·4301 gramme $Mg_2P_2O_7$ = 0·3787 gramme H_3PO_4, or 43·94 per cent. H_3PO_4.

1·0796 gramme was treated with sulphuric acid and potassium nitrate as before described, the liquid diluted, made alkaline with ammonia, then acidified with acetic acid, and made up to 250° c.c. when cold. Portions of this were titrated with standard uranium nitrate solution, of which 1 c.c. = 0·005 gramme P_2O_5, or 0·0069 gramme H_3PO_4. One portion of 50 c.c. required 13·91 c.c. of uranium solution, another 50 c.c. required 14·05 c.c. of uranium solution; the mean of the two is 13·98 c.c. = 0·0965 gramme H_3PO_4, or 44·68 per cent. H_3PO_4.

On account of the contamination of this salt with calcium, it is obviously useless to attempt to calculate a chemical formula from the above results; but they nevertheless serve to show that the amount of phosphoric acid contained in this product is also not in accordance with the formula suggested by Parsons and Wrampelmeier, for a salt obtained by the method employed by them—viz., $C_{20}H_{17}NO_4 \cdot 7H_3PO_4 \cdot 4H_2O$, which would require 6·59 per cent. of water and 62·76 per cent. H_3PO_4.

The same salt, but purified by recrystallisation, and free from calcium, as previously noted, was now analysed. The water of

crystallisation was determined by heating to 110° C., until of constant weight, the phosphoric acid gravimetrically, as with the first salt described, and the base by precipitation with platinic chloride.

(1) 0·3834 gramme of the salt lost 0·0103 gramme at 110° C. corresponding to 2·68 per cent. of water and gave 0·1589 gramme $Mg_2P_2O_7$, corresponding to 0·1399 gramme or 36·49 per cent. H_3PO_4.

(2) 0·5053 gramme of the salt lost 0·0136 gramme at 110° C., corresponding to 2·69 per cent. of water, and gave 0·2083 gramme $Mg_2P_2O_7$, corresponding to 0·1834 gramme or 36·30 per cent. H_3PO_4.

(3) 0·2052 gramme of the salt gave 0·0362 gramme of platinum, corresponding to 0·1244 gramme or 60·62 per cent. of berberine.

(4) 0·1920 gramme of the salt gave 0·0338 gramme of platinum, corresponding to 0·1162 gramme or 60·52 per cent. of berberine.

		(1)	(2)	(3)	(4)	Calculated for $C_{20}H_{17}NO_4 \cdot 2H_3PO_4 + H_2O$
H_2O	=	2·68	2·69	—	—	3·28 per cent.
H_3PO_4	=	36·49	36·30	—	—	35.70 „
$C_{20}H_{17}NO_4$	=	—	—	60·62	60·52	61·02 „
						100·00

From these results it will be seen that the berberine phosphate prepared by me, either by treating pure berberine-acetone with an excess of phosphoric acid, or by the interaction of mono-berberine sulphate and acid calcium phosphate, and subsequent purification of the product, has the composition $C_{20}H_{17}NO_4 \cdot 2H_3PO_4$, with varying amounts of water of crystallisation.

It thus agrees with the results obtained by Parsons in his analysis of a pure salt prepared by Willmarth, but, as was anticipated, disproves the formula $C_{20}H_{17}NO_4 \cdot 7H_3PO_4 + 4H_2O$ assigned by Parsons and Wrampelmeier to a salt prepared by the interaction of berberine sulphate and acid calcium phosphate, notwithstanding the fact that one of my salts was prepared by the method followed by them, although carefully purified from calcium before analysis, and that we have employed the same methods for the determination of the base and the acid.

The latter investigators had themselves remarked that "this formula seems, at first sight, an improbable one," and the support that was given to it by the subsequent experiments of Coblentz cannot be considered altogether satisfactory or conclusive, for although he worked with the pure alkaloid and an excess of

phosphoric acid, he appears to have made no direct determination of the base, and only determined the amount of phosphoric acid present by indirect methods.

It will be seen that my results also do not confirm the formula given by Schmidt, viz.: $(C_{20}H_{17}NO_4)_3(H_3PO_4)_2 + 5H_2O$, but, as previously noted, not having been able to find any record of analytical data relating to this formula, it can only incidentally be referred to.

The accuracy of the determinations of the base by means of platinic chloride I have confirmed by control experiments with pure berberine salts of well-established composition, such, for example, as the nitrate and sulphate, which were likewise prepared by myself.

It was thought of interest to compare the results obtained by this method with the less accurate determinations of the berberine by weighing it in the form of the berberine-chloroform compound, and these are presented in the following table:—

Berberine Salt used. B = Berberine, $C_{20}H_{17}NO_4$.	Weight of Salt taken.	Weight of Chloroform Compound obtained.	Weight of Platinum Residue.	Weight of corresponding amount of base.	Percentage of base found.	Percentage of base calculated $C_{20}H_{17}NO_4 = 335$ Pt. = 194·8.
$B \cdot HNO_3$	0·5274	0·6074	—	0·4474	84·90	84·16
	0·1956	—	0·0479	0·1647	84·20	
$B \cdot H_2SO_4$	0·3831	0·4118	—	0·3035	79·23	77·36
	0·3384	0·3594	—	0·2649	78·29	
	0·1953	—	0·0441	0·1516	77·62	
$B \cdot 2H_3PO_4 + 1\frac{1}{2}H_2O$	0·6574	0·5312	—	0·3915	59·56	60·04
	0·5826	0·4788	—	0·3529	60·56	
(From acetone compound with phosphoric acid)	0·2268	—	0·0392	0·1348	59·43	
	0·1868	—	0·0326	0·1121	60·01	
$B \cdot 2H_3PO_4 + 1H_2O$	0·2052	—	0·0362	0·1244	60·62	
From $B \cdot H_2SO_4$ and $CaH_4(PO_4)_2$ (re-crystallised)	0·1920	—	0·0338	0·1162	60·52	61·01

NOTES ON OPIUM, OLIVE OIL, AND SACCHARIN.

By Edwin Dowzard, F.C.S.

Opium.

The B.P. describes opium as the juice obtained by incision from the unripe capsules of *Papaver somniferum*, Linn., inspissated by spontaneous evaporation. When dried and powdered it should

yield not less than 9·5 and not more than 10·5 per cent. of anhydrous morphine.

Years ago the late M. Conroy said (*R.J.* [3], 16, 378): "This standard is ridiculously low, and will have the effect of depriving medicine of all the best opium that reaches this country. It is all very well to standardise preparations, but I think it is going too far when we attempt it with natural products; but if we are to have a maximum and minimum standard for opium, let it be one which will include the best and exclude the inferior and adulterated kinds instead of the reverse, as now obtains. To attain this it would be necessary to raise the standard at least 2 per cent."

The following figures confirm the above statement, and show that the standard could be raised considerably without inconvenience:—

Morphine in Dried and Powdered Opium (Before Standardisation).

	Per Cent.		Per Cent.		Per Cent.		Per Cent.
No. 1..	12·3	No. 8..	12·9	No. 15..	13·7	No. 22..	14·3
„ 2..	12·4	„ 9..	13·0	„ 16..	13·8	„ 23..	14·7
„ 3..	12·4	„ 10..	13·0	„ 17..	13·9	„ 24..	14·9
„ 4..	12·6	„ 11..	13·2	„ 18..	14·0	„ 25..	14·9
„ 5..	12·6	„ 12..	13·3	„ 19..	14·1	Minimum	12·3
„ 6..	12·8	„ 13..	13·4	„ 20..	14·1	Maximum	14·9
„ 7..	12·8	„ 14..	13·7	„ 21..	14·2		

Olive Oil.

According to the B.P. the specific gravity of olive oil varies between 0·914 and 0·919. The latter figure is much too high, as it allows the use of inferior oils pressed at high temperatures. We must suppose that the pharmacopœial authorities intend that the purest oils shall be used. If so, then the maximum figure must be altered.

According to Lewkowitsch (*Chemical Analysis of Oils, Fats, and Waxes*): "The specific gravity of olive oil varies from 0·914 to 0·917, but may rise to 0·920, and even 0·925 in the case of commercial oils expressed at a higher temperature owing to the larger proportion of palmitin."

In the following table will be found the specific gravities and refractometer numbers (determined by means of Amagat and Jean's oleo-refractometer of fifty-two samples of olive oil, the qualities of which range from common hair oil to the best qualities obtainable.

It will be seen that forty samples have a specific gravity ranging

between 0·9155 and 0·9165, seven a specific gravity of 0·915, four a specific gravity of 0·917, and one a specific gravity of 0·9172.

No.	Sp. gr. at 15·5° C.	Refractometer Number at 22° C.	
1	0·9156	+1·5	Algerian.
2	0·9160	+2	
3	0·9170	+1	
4	0·9160	+3	
5	0·9160	0	Barcelona.
6	0·9160	+1	Bari, A, B, C, and D Qualities.
7	0·9160	0	
8	0·9160	+2	
9	0·9164	+2	
10	0·9160	+1	
11	0·9150	+1	
12	0·9160	+1	
13	0·9150	−0·5	
14	0·9160	0	
15	0·9160	0	
16	0·9160	0	
17	0·9150	−1	
18	0·9155	0	
19	0·9150	0	
20	0·9165	+0·5	
21	0·9165	0	
22	0·9160	+2	
23	0·9150	−0·5	Corfu.
24	0·9150	+0·75	
25	0·9150	+1	
26	0·9170	0	
27	0·9165	+1·5	Cream Tuscan.
28	0·9160	+1·5	
29	0·9155	+2	
30	0·9160	+1	
31	0·9170	+1	
32	0·9160	+3	
33	0·9160	0	Extra Cream.
34	0·9172	+2	Cream Virgin.
35	0·9160	+1	
36	0·9160	0	Best Sublime.
37	0·9165	0	Mytelene.
38	0·9160	−0·5	Zante.
39	0·9160	−1·0	
40	0·9160	0	
41	0·9170	0	Various.
42	0·9160	+1	
43	0·9160	+1	
44	0·9160	0	
45	0·9160	0	
46	0·9160	+2·5	
47	0·9160	0	
48	0·9155	−1	
49	0·9165	−1	
50	0·9160	0	
51	0·9165	+1	
52	0·9160	+1·5	

Saccharin.

At the present time the two principal qualities of saccharin are known as "550" and "350," the number, of course, referring to the sweetness compared with cane sugar.

By the following method, which depends upon the solubility of saccharin in acetone, 550 can be easily and quickly distinguished from 350, and the amount of pure saccharin (550) in 350, or a mixture of 350 and 550, can be approximately estimated.

One gramme of 550 saccharin should be perfectly soluble in 12 c.c. of acetone (at about 16° C.). If the sample is 350 or a mixture of 350 and 550, there will be a considerable amount of insoluble matter.

One gramme of 350 saccharin is treated with 10 c.c. of acetone; the mixture is thoroughly agitated and allowed to stand for about ten minutes (precautions must be taken against evaporation), 5 c.c. of the clear solution is then evaporated and the dry residue weighed. This multiplied by 200 will give the approximate percentage of saccharin present. This method is useless for so-called "soluble saccharin."

THE VISCOSITY OF ESSENTIAL OILS.

By Edwin Dowzard, F.C.S.

For some time past it has been the practice of manufacturers to sell lemon oil on the basis of its citral content, but, even if this body could be determined with accuracy, it would not give much information respecting the purity or otherwise of the oil. Suppose a pure oil contained 6 per cent. of citral, then it would require about 12 per cent. of turpentine to reduce it to 5·3 per cent. The addition of this amount of turpentine could not be detected by the citral estimation, but it could easily be detected by the polarimeter. Again, if citrene (the terpene obtained in the manufacture of concentrated lemon oil) was used instead of turpentine, neither the determination of the citral nor the optical rotation would be of any avail. We have now to contend with a sophistication which is practically impossible to detect—viz., citrene containing about 7 per cent. of added citral (from lemon grass oil). To show the impossibility of detecting such a mixture the following figures are given:—

No. 1.

CITRENE + 7·5 per cent. CITRAL.

Sp. gr. 15·5° C. 0·8530. Optical rotation, 20° C. +64·45° C.

No. 2.

PURE LEMON OIL.

Sp. gr. 15·5° C. 0·8585. Optical rotation, 20° C. +60°.

No. 3.

PURE LEMON OIL, containing 25 per cent. of above mixture.

Sp. gr. 15·5° C. 0·8571. Optical rotation, 20° C. +61·11°.

It will be seen that such an oil as No. 3 would pass the tests for sp. gr., rotation and citral, and would therefore be certified as pure.

I have made a few experiments on the viscosity of pure lemon oil, citrene, and a mixture of citrene (92·5 per cent.) and citral (7·5 per cent.). The results seem to indicate that useful information may be obtained by the determination of this constant. (All the determinations were made with a Reischauer's viscometer.)

Viscosity standard. 40 c.c. of water (at 20° C.) is introduced into the inner tube. The time required for 10 c.c. to run out is noted = 222 seconds. The sample of oil is treated in exactly the same manner, and the viscosity number calculated as follows:—

$$\text{Viscosity number} = \frac{O}{W} \times 100.$$

O = Oil time in seconds.
W = Water time in seconds.

	Viscosity number.
Pure lemon oil	139·6
Citrene	105·8
Citrene + 7·5 per cent. Citral	114 9

If the viscosity of lemon oil is fairly constant, the above test may be of some value. This, however, can only be determined by those who are in a position to obtain absolutely authentic samples.

I have also determined the viscosity of several other oils, which are given below:—

	Viscosity number.
Lime oil	177
Bergamot oil	219·8
Orange oil	112·5
Citronella oil	536
Rosemary oil	320
Winter Green oil	261
Sassafras oil	238

The wide differences between these oils indicate that this test, in conjunction with the usual ones, will give valuable information respecting the purity of essential oils.

BRITISH GUIANA COPAIBA.

By E. Wightman Bell, F.C.S.

My thanks are due to Mr. E. M. Holmes, F.L.S., for kindly furnishing me with this specimen. The oleo-resin is of a pale yellow colour somewhat less viscous than ordinary samples of copaiba, and possesses the usual taste and smell. Its specific gravity is 0·9797 and when evaporated to dryness, a residue remained, which was "hard and easily rubbed to powder." In absolute alcohol the sample is almost entirely soluble, leaving only a very small quantity of flocculent insoluble matter. It is entirely soluble in petroleum spirit. When treated with the reagents named in the British Pharmacopœia for detecting the presence of gurjun balsam, negative results were obtained.

The oleo-resin required for neutralisation of the acids present in each gm. 1·48 c.c. of normal alcoholic potash, equal to an acid number[1] of 82·88, and for complete saponification a further 0·19 of normal alkali was required, giving an ester number[1] 10·64, consequently the total saponification number was 93·52. Evaporated on a water-bath, and finally heated in an oven having a temperature of 98°–100° C. until of constant weight, the loss was 52·11 per cent., giving the composition of the copaiba as :—

Essential oil	52·11
Resin	47·89
	100·00

The essential oil obtained by steam distillation has a specific gravity of 0·9024, and a rotation of −9° in 100 mm. tube. It did not boil below 245° C., and on fractionation yielded as below :—

245–251° = 34 per cent.
251–255° = 57 „ „
Residue 9 „ „

The iodine absorption of the oil was 252·8 per cent. With the usual solvents it behaved in a similar manner to commercial copaiba oil.

The oil did not reduce gold chloride, and on being treated with a 5 per cent. solution of bromine in chloroform (Dragendorff's solution) it acquired a green colour, without any trace of purple. When dissolved in carbon bisulphide no colour was developed on adding nitro-sulphuric acid.

[1] The "number" in each case being obtained by multiplying the c.c. of normal alkali required for 1 gm. by 56.

With the exception of the optical rotation of the oil this copaiba appears to answer all the characters and tests of the British Pharmacopœia, in fact, in some respects it is shown to be of a higher grade of purity than many samples which meet the official requirements. Mr. F. W. Short has pointed out that the rotation figures named in the Pharmacopœia are probably given in error, and this is the opinion of the writer, as will be shown in another communication.

COPAIBA: ITS ASSAY AND TESTS.

By E. Wightman Bell, F.C.S.

Do commercial samples of copaiba answer the requirements of the British Pharmacopœia, and should the tests therein described be altered or increased? These are the considerations which led up to these notes.

Percentage of Essential Oil.

It would be as well if a process for determination of oil was given in the Pharmacopœia. Some analysts may estimate the amount of oil by the quantity collected on distillation, whilst others might obtain their figures from the loss in weight on heating, and, in this case, the results may vary according to the temperature.

By heating on a water-bath, and finally in a water-oven, at a temperature of just below 100° C., until the weight be constant, very concordant results are obtained. The time occupied is somewhat long, viz., twelve to sixteen hours, but no attention is necessary, and, in the writer's opinion, this is the most trustworthy method. The percentages of oil given below were obtained by this process:—

No.	S.G.	Ess. Oil Per Cent.	
1	0·9914	44·86	
2	0·9956	36·60	
3	0·9880	42·80	
4	1·0096	38·62	Very old.
5	1·0015	36·03	
6	0·9903	44·21	
7	0·9906	39·49	
8	0·9894	43·85	
9	0·9797	52·11	British Guiana.
10	0·9324	72·80	Para.
Gurjun Oil.	0·9566	69·63	

From the preceding table it will be seen that whilst samples are easily obtainable containing the amount of oil, and answering the s.g. of the Pharmacopœia, other samples (otherwise of good quality) do not.

All the above samples of copaiba were soluble, or almost entirely so, in absolute alcohol and petroleum spirit. The residues were readily reduced to powder, and no smell of turpentine was evolved on evaporation (the latter is, however, a very crude test, and in view of the boiling point of the oil being taken is quite needless).

Rotation of Essential Oil.

As has already been pointed out (by Mr. F. W. Short) there is probably an error in the figures given for the rotation of the oil in the Pharmacopœia, the rotation therein stated, presumably for a 100 mm. tube, being almost identical with the figures given by Mr. J. C. Umney (*Year-Book of Pharmacy*, 1893) for a 200 mm. tube. That American copaiba oil is lævorotary is doubtless correct, but it is doubtful if genuine samples rotate within the limits of $-28°$ to $-34°$. In fact it is most probable that genuine samples rotate very considerably less.

The following table gives the rotation of the oils distilled from some of the samples above named, and also of two commercial samples of oil:—

No.	Rotation.	Notes.
3	$-21°$	Doubtful purity.
5	$-22°$	,, ,,
7	$-16°$	,, ,,
8	$-34°$	,, ,,
9	$-9°$	Pure.
11	$-11°$	,,
12	$-16°$	,,
Distilled Gurjun Oil.	$-3°$	——

With the exception of Nos. 9, 11, and 12, all the samples of oil gave a distinct violet coloration when treated with nitro-sulphuric acid after solution in carbon bisulphide, the presence of gurjun balsam being thus most probable; the depth of colour being in the same ratio as the rotation—the greater the rotation the more marked the colour. When treated with Dragendorff's bromine solution all except Nos. 9, 11, and 12, gave a dirty blue to purple

colour, whilst these three developed a beautifully clear green colour. It will be seen that the addition of a small quantity of gurjun balsam will very materially increase the rotation figure of the oil.

Boiling Point of Oil.

All the oils commenced to boil at 245–250° C., and a sample of oil distilled from gurjun balsam was found to boil at about the same temperature. The determination of the boiling point is useful in showing the presence of turpentine, which will very materially lower it.

Colour Tests.

Of the two colour tests given in the Pharmacopœia, that with nitro-sulphuric acid and carbon bisulphide is undoubtedly the better, the acetic and nitric test being in my hands much less sensitive, and also slower. With reference to the first-named it is important, in order to obtain the best results, that the tube in which the test is performed should be quite dry. Probably it is only the intention to pick out grossly adulterated samples; in my opinion absolutely pure copaiba is very uncommon—almost unobtainable. Of the samples previously named none reacted when the test was applied to the oleo-resin, but with the exceptions named in the previous table the presence of gurjun was shown on testing the distilled oil. If it is wished to obtain an absolutely pure copaiba (which considering the conditions of collection is of doubtful probability), the test should then be made on the oil, and not on the oleo-resin as at present.

Titration Figures.

About 5 gm. of copaiba are dissolved in warm, neutral alcohol, phenol-phthalein added, and titrated with alcoholic potash of known strength; the number of c.c. of *normal* alkali used for each gm. multiplied by 56 gives the "acid number." A further quantity of alcoholic potash (an excess) is then added, and the contents of the flask kept boiling for about an hour. After dilution with alcohol the solution is to be titrated with standard acid; the number of c.c. of normal alkali consumed by each gm. multiplied by 56 gives the "ester number." The "saponification number" is the sum of the acid and ester numbers.

No.	N/1 Alkali for 1·00 for Acids.	Acid No.	N/1 Alkali for 1·00 for Esters.	Ester No.	Sapon. No.	Resin Factor = Resin. ÷ Sapon. No.
1	1·47	82·32	0·28	15·68	98·00	0·56
2	1·67	93·52	0·35	19·60	113·12	0·56
3	1·41	78·96	0·41	22·96	101·92	0·56
4	1·63	91·28	0·35	19·60	110·88	0·55
5	1·64	91·84	0·36	20·16	112·00	0·57
6	1·57	87·92	0·20	11·20	99·12	0·56
7	1·56	87·36	0·39	21·84	109·20	0·55
8	1·43	80·08	0·26	14·56	94·64	0·59
9	1·48	82·88	0·19	10·64	93·52	0·51
10	0·56	31·36	0·42	23·52	54·88	0·49
Gurjun.	0·18	10·08	0·11	6·16	16·24	1·87

It will be observed from the above table that there is a very close connection between the saponification number and the percentage of resin, and that the factor for commercial samples (obtained by dividing the resin percentage by the saponification number) is between 0·5 and 0·6, whilst the factor for gurjun balsam is about 1·8. Qualitative tests of the oleo-resins have shown that copaibas which have the lowest factors give the slightest reaction for gurjun, when applied to the distilled oil.

I would suggest that a definite method for obtaining the percentage of oil be given, preferably that of evaporation at about 100° C.; that the rotation figures of the essential oil be lowered; and that titration of the oleo-resin be introduced, and a "resin-factor" added.

My best thanks are due to my assistant, Mr. F. Y. Cope, for kind help in making many of the estimations for this and the preceding paper.

NOTE ON PHENOL SUPPOSITORIES.

By Frank R. Dudderidge, F.C.S.,

Pharmaceutical Chemist.

My attention has frequently been called to the difficulty experienced in obtaining these suppositories sufficiently firm in hot weather to be readily removed from the mould, the quantity of white beeswax—two grains in each suppository—ordered in the official formula being apparently inadequate to harden them sufficiently. To remedy this defect the addition of more wax has been tried,

three and four grains being used instead of two: but the result has not proved satisfactory, the finished suppositories being very little, if any, firmer than those containing two grains of wax. It was noticed that whether prepared with a larger or smaller proportion of wax, these suppositories had a tallowy, somewhat plastic consistence, lacking the brittle fracture characteristic of an oil of theobroma suppository. This result seemed to indicate that the presence of wax produced the alteration in the physical consistence, and as it would also raise the melting point, it was considered advisable to prepare a batch with oil of theobroma only, no wax whatever being added, to determine whether this were so. It was found that when care was taken to melt the oil of theobroma at as low a temperature as possible, then add the phenol and pour into moulds, the result left nothing to be desired, the suppositories produced being quite firm and brittle, and solidifying much more rapidly than those containing any wax, thus proving that the alteration in consistence was not due to the phenol, but to the wax. A similar result was obtained in the case of suppositories each containing five grains of chloral hydrate. When the finely powdered chloral was stirred into the just melted cacao-butter a firmer and more brittle suppository was produced than when white beeswax was added, but with larger quantities of chloral hydrate the result was less satisfactory.

Melting points of the oil of theobroma, the phenol suppositories without wax, and B.P. phenol suppositories were taken, the same sample of oil of theobroma being used in each case, and the method given under "Cera Flava" in the Pharmacopœia being followed with the subjoined results:—

Oil of Theobroma.	Phenol Suppositories (without wax).	Phenol Suppositories B.P.
(1) 31·0° C.	(1) 31·5° C.	(1) 51·0° C.
(2) 30·5° C.	(2) 31·0° C.	(2) 51·5° C.
(3) 30·5° C.	(3) 31·5° C.	(3) 50·5° C.
(4) 31·0° C.	(4) 31·5° C.	(4) 51·5° C.
average 30·75° C.	average 31·375° C.	average 51·125° C.

As the addition of so small a quantity of white beeswax as two grains raises the melting point nearly 20° C. without producing the required firmness, but rather produces the result it was intended to obviate, I would suggest that the basis for these suppositories be oil of theobroma only in future editions of the B.P. My thanks are due to Mr. S. R. Blackburn for his kind assistance in these experiments.

SOME PHARMACOPŒIAL TINCTURES.

By J. C. McWalter, D.Ph., L.R.C.S., Etc.

In the beginning of this year the secretary of the Irish Pharmaceutical Society sent a circular to the members of the Society, requesting them to note the specific gravities of any tinctures which they might make according to the B.P. for a period of three months, and also the weight of the residue obtained after evaporating an ounce of such a tincture to dryness.

As the information was stated to be for the use of the committee working in reference to the next edition of the British Pharmacopœia, I think we may assume, without breaking any confidences, that there exists an intention to fix standards for tinctures in the coming B.P. Much of the work of the British Pharmaceutical Conference lies in the direction of improving the methods, processes, and standards of the Pharmacopœia, and hence the subject becomes one of immediate and important interest to all its members.

The figures given below are the result of the circular referred to, but I tender them with a multitude of apologies. The number of inaccuracies which are liable to creep into such an apparently simple matter as diluting a given alcohol and making a simple tincture are simply startling when the operation is performed by the mere retailer or his assistants. Some of the figures which I had already published I have found necessary to reform altogether. Hence, those given now cannot claim anything like the respect due to those of Messrs. Fletcher, Umney, Southall, Gadd, Farr and Wright, etc, but they may serve some useful purpose as indicating what latitude must be allowed to the pharmacist whose desire to follow the Pharmacopœial instructions is often greater than his ability.

	Specific Gravity (15° 5 C.)	Weight of residue in grains per ounce.
Tinctura Aconiti	0·893	4
,, Aloes	8·965	20
,, Arnicæ	0·891	2
,, Asafœtidæ	0·906	28½
,, Aurantii	0·880	17½
,, Belladonnæ	0·916	9
,, Benzoini Composita	0·885	59
,, Buchu	0·927	10
,, Calumbæ	0·920	6
,, Camphor Co.	0·922	1½
,, Cannabis Indicæ	0·845	16
,, Cantharidis	0·835	2

	Specific Gravity (15°·5 C.)	Weight of residue in grains per ounce.
Tinctura Capsici	0·899	6
„ Card. Co.	0·949	28
„ Cascarillæ	0·901	6½
„ Catechu	0 973	55
„ Chiratæ	0·926	4½
„ Cimicifugæ	0·919	6
„ Cinchonæ	0 913	24
„ Cinchonæ Co.	0·916	22
„ Cinnamomi	0·909	8
„ Cocci	0·948	16
„ Colchici Sem.	0·958	18
„ Conii	0·895	7
„ Croci	0·929	8
„ Cubebæ	0·845	8
„ Digitalis	0·926	16
„ Ergotæ Ammoniata	0·932	9½
„ Ferri Perchloridi	1·087	80
„ Gelsemii	0·916	4
„ Gent. Co.	0·964	22
„ Guaiaci Ammon.	0·894	62
„ Hamamelidis	0 952	10
„ Hydrastis	0·928	7
„ Hyoscyami	0·951	9
„ Iodi	0·885	—
„ Jaborandi	0·955	16
„ Jalapæ	0·917	32
„ Krameriæ	0·936	18
„ Kino	1·025	56
„ Lavand. Co.	0·844	2
„ Limonis	0·881	2½
„ Lupuli	0·941	24
„ Myrrhæ	0·850	12
„ Nucis Vomicæ.	0·855	8
„ Opii	0·950	16
„ Podophylli	0·851	15
„ Pruni Virg.	0·937	14
„ Pyrethri	0·899	12
„ Quassiæ	0·956	5½
„ Quillaiæ	0·915	6
„ Quininæ	0·883	16
„ Rhei Co.	0·954	46
„ Scillæ	0·965	45
„ Senegæ	0·933	20
„ Sennæ Co.	0·981	54
„ Serpentariæ	0·918	6
„ Stramonii	0·956	22
„ Strophanthi	0·888	2
„ Sumbul	0·898	12
„ Tolutanæ.	0·874	34
„ Valerianæ Ammon.	0·937	24
„ Zingiberis	0·855	7

I notice that the weight of the residue shews much greater variation than the specific gravity. Whilst 0·010 would cover the differences seen in most of the tinctures of which the results have

been published, the variation of the weight of residue differs by as much as 50 per cent. If, therefore, the compilers of the new B.P. intend to publish standards for residues, they will need to allow a very great limit—so much so as to be of little use.

If this paper should prove of any use, the credit is mostly due to my assistant, Miss L. Smyth, and Mr. P. T. Cosgrave, who have worked very assiduously at the subject.

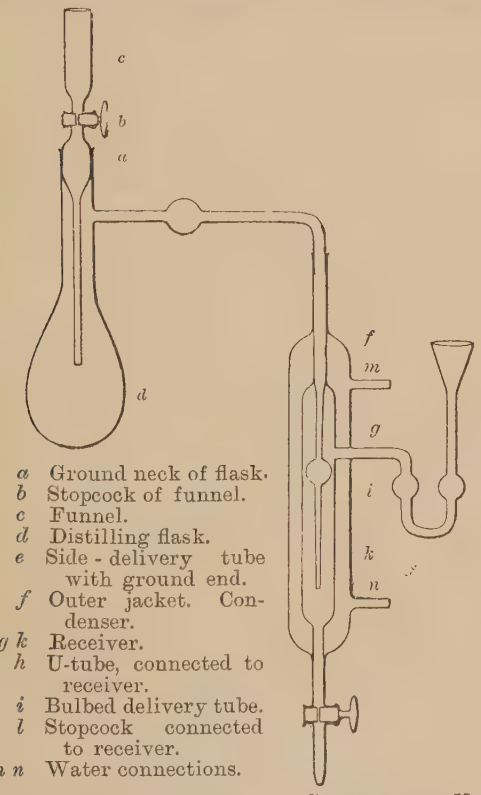
NEW APPARATUS FOR DETERMINATION OF CHLORINE AND NITROGEN.

By J. F. Tocher, F.I.C., F.C.S.

In a recent paper on "The Volumetric Determination of Red Lead" (*P.J.*, 1900, 10, 310–312), I introduced, among others, the chlorine method, and suggested the use of an all-glass apparatus as certain to give more accurate results, besides greater rapidity in estimation. Where a large number of determinations have to be made, the use of cork is highly undesirable, while another objection lies in the fact of having to connect and disconnect all parts of the apparatus for each determination. In the paper alluded to I used the form of apparatus described by Fresenius, consisting of a small flask fitted with a paraffin-soaked cork and connected to a bulbed U-tube (immersed in a beaker of water) by means of a bent glass tube. It occurred to me that an apparatus could be devised which would meet the objections stated, and at the same time be useful in the estimation of nitrogen by the Kjehldahl method. An apparatus in constant use ought to be easily handled, and to consist of as few parts as possible. The apparatus here described is in two parts: (1) flask with stoppered funnel; (2) condenser-receiver. The flask is about 500 c.c. capacity, of hard glass, and is supplied with a stoppered funnel ground at (*a*) to fit the flask. The side-delivery tube (*c*) has its extreme end bent at right angles, and is ground to fit the upper part of the receiver (2), which is really a condenser and receiver combined. The outer jacket (*f*) has the outlet and inlet tubes (*m.n.*) for the supply of water. The inner space (*g.k.*) is the receiver, from the upper part of which hangs the bulbed delivery tube (*i*), connected direct with the side tube from flask, as shown in the diagram. The U-tube (*h*) passes through the outer jacket and into the receiver. The stopcock (*l*) is used to draw off the liquid in the receiver.

When the apparatus is in use the receiver is clamped in an

upright position to a suitable stand and connected to the water supply. A weighed quantity of the peroxide or other substance under examination is introduced into the flask and slightly moistened with water. A rotatory motion is given to the flask to ensure a uniform mass and to prevent caking. The flask is then fitted to upper part of receiver (by means of ground end of side tube) and is



Apparatus for Determination of Chlorine and Nitrogen.

clamped to stand. An excess of potassium iodide solution is run into receiver through the bulbed delivery tube until it is sealed about $\frac{1}{2}$–$\frac{3}{4}$ inch. A small portion is also placed in the U-tube. The funnel is next fitted to the flask and pure hydrochloric acid poured into the upper part. A sufficient quantity is run into the flask, to which heat is now gently applied. When all the chlorine has been

The above block was kindly lent by the Editor of the *Pharmaceutical Journal*.

evolved a vacuum is created, and there is usually a slight regurgitation of the potassium iodide solution. This is checked when the level of the fluid reaches the point of the delivery tube, and air passes up and bubbles through the drawn-up iodide solution in the bulb into the flask, loss being thus entirely prevented. This arrangement disposes of the necessity of using magnesite, recommended by Fresenius. Distillation is continued for a short time to catch the last traces of chlorine. The flask is then disconnected and the fluid run out of receiver through stopcock (*l*) into a porcelain basin. The contents of the U-tube are syphoned into receiver by the addition of water, a little being also run down through delivery tube for the same purpose, and the washings run into the original fluid in the basin, which is now ready for titration with thiosulphate in the usual way. In the estimation of nitrogen by the Kjehldahl method the nitrogenous substance can be decomposed in the flask with sulphuric acid, cupric oxide (as recommended by Proctor and Turnbull, see *J.S.C.I.*, 1900, vol. xix., p. 130–131) and potassic sulphate in the usual way. After cooling and the subsequent addition of a little water, some paraffin, and some zinc filings are added, and a flask connected to the condensing receiver containing a known quantity of normal sulphuric acid, a small portion of which is placed in the U-tube. An excess of strong soda solution is next run into the flask through the funnel. Owing to the presence of copper, the proper quantity of soda to be added can be accurately gauged. Heat is now applied and the operation completed, when the acid is run out, the receiver washed thoroughly through the U-tube, and the fluid titrated.

The advantages of the apparatus may be briefly stated as follows:—(1) Loss of chlorine (or ammonia) is entirely prevented by introduction of H Cl (or soda) through stoppered funnel. No novelty is claimed for this arrangement, which is in use in many laboratories. (2) Loss is prevented by having glass connections throughout. (3) The condensing apparatus is also the receiver, and disposes of the U-tubes and connections in the case of chlorine, and of the addition of ammonia absorption flask to Liebig's condenser, in the case of nitrogen. (4) The fluid and washings can be readily run off for titration, and the apparatus is then ready without further work for another operation. (5) In nitrogen estimations the flask can be used with advantage in decomposing the nitrogenous substance prior to distillation, and prevents possible loss in transference.

GENERAL BUSINESS.

The Unofficial Formulary Committee.

Mr. WARDLEWORTH moved that the following gentlemen of the Formulary Committee be re-elected: Messrs. A. C. Abraham, F.I.C., F.C.S.; F. C. J. Bird; Peter Boa; N. H. Martin, F.L.S., F.R.M.S.; W. Martindale, F.L.S., F.C.S.; F. Ransom, F.C.S.; Dr. C. Symes, Ph.C., F.C.S.; H. Wilson, F.I.C., F.C.S.; H. Wilson, F.C.S.; R. Wright, Ph.C., F.C.S.; and W. A. H. Naylor, F.I.C., F.C.S.

Mr. WIPPELL GADD said he had much pleasure in seconding the motion. The formulary reminded him of a story in *An Evening with Punch*. A guest at a tenant-farmers' dinner, receiving a liqueur in a glass, called a waiter and said, "Young man, bring in some of that in a mug." Like Oliver Twist, they wanted some more.

The election was unanimously agreed to.

Place of Meeting for 1901.

Mr. BEGGS said that it would be within the recollection of most of the members who visited Plymouth last year that he, in conjunction with some of his colleagues, came over with the express intention of giving an invitation. They knew at that time that it could not be accepted, but they did not offer because of that. But, being Irishmen and always wishing to be at the front, they gave that invitation so as to be in the front this year. They were there to-day to ask the members of the Conference to again visit Dublin, and he offered them a hearty welcome on behalf of the chemists and pharmacists of Dublin and the South of Ireland. He felt that the task before them was a large one, but, as he mentioned at the outset, the Irish would tackle anything. If they came to Ireland they would have a complete change from what they had there in London. He had considerable influence with the clerk of the weather, and they had had such an amount of melting-point that he had determined to leave it out of their formula for next year. If they came he was positive that he could offer them, on behalf of Dubliners, a most cordial welcome. Their city was well known for its hospitality. They were poor, but they had very large hearts. They had not many manufactures in Dublin, but they had a few which appealed—should he say to the taste? They made good whisky, and, going a little lower, they had stout. They could show some flourishing manufactures in that line. Unfor-

tunately, their shipping industry had been taken away, and had gone to their brethren in the north. As regarded scenery, they were within half an hour's drive of the garden of Ireland. Nothing would be left undone to make the visit to Ireland a success; they had already approached the chief magistrate of the city, and he had promised to receive them if they came, and should he not be in office, his successor would follow (laughter). He would follow in the good intentions (loud cheers).

Mr. KELLY said it was with great pleasure that he supported the invitation, and to the bachelors present he would very much like to give a word of warning. Dublin was noted for its magnificent scenery and the beauty of its women. It was the capital of a land which manufactured the generals who had unfurled the British flag, and had placed it in the forefront in South Africa (cheers).

Mr. CUNNINGHAM said that if they came to Dublin they would be well entertained. The fresh air of County Wicklow would benefit them all far more than the hot air of the factories and the smoke of shipbuilding yards. He hoped they would come.

The PRESIDENT said when he had the pleasure of enjoying the hospitality of Irishmen in the North of Ireland, he felt satisfied that the Irishmen in the South would want to see whether they could not outvie their compatriots. They would, he thought, act very unwisely if they, as a Conference, did not accept the very kind invitation held out to them. He heartily hoped that he would be able to go.

Mr. UMNEY said that Mr. Beggs might be well assured that they would accept the invitation. He thought the bachelors might be permitted to go and take their chance. He moved that the invitation should be accepted with the greatest cordiality. He hoped that they would enjoy themselves as much as they did at Belfast.

Mr. RUTHERFORD HILL said it was a great pleasure and a high honour to second the resolution moved by Mr. Umney. It was his good fortune to be engaged, as a pill-roller, in one of the largest pharmaceutical establishments in Ireland when the Irish Pharmaceutical Society came into existence with the Irish Pharmacy Act of 1875. He had thus had opportunities of seeing the beauty of the land and becoming acquainted with the geniality, the vivacity, the inimitable humour, and the abounding hospitality of the Irish people. He felt assured they would receive a royal welcome, and a recent illustrious instance enabled them to realize what an Irish royal welcome meant. Might he venture to express the hope that

one outcome of that acceptance would be a deeper, and fuller, and truer realization of the essential unity of British and Irish pharmacy than had ever yet been attained. Might he not, without undue presumption, adapt the words of his illustrious fellow-countryman, and say:—

"Then let us pray, that come it may,
It's comin' yet for a' that,
When pharmacists these islands o'er
Shall brothers be for a' that."

He begged to second the resolution.

The PRESIDENT put the resolution to the meeting, and it was carried with acclamation.

Mr. CUMMINGS (Dundee), on the part of the chemists of that town and neighbourhood, invited the Conference to meet in Dundee in 1902.

Mr. NAYSMITH (Arbroath) seconded the invitation very warmly.

The PRESIDENT said it was very pleasant to have an invitation two years in advance, and he was sure, if next year the members accepted it, and went to Dundee, they would receive a very cordial welcome.

ELECTION OF OFFICERS FOR 1900 TO 1901.

The following officers were unanimously elected for the ensuing year:—

President.—G. Claridge Druce, M.A., F.L.S., Oxford.

Vice-Presidents.—G. T. W. Newsholme, F.C.S., Sheffield; G. D. Beggs, Dublin; Peter Boa, Edinburgh; Prof. Tichborne, Ph.D. F.I.C., Dublin.

Treasurer.—J. C. Umney, Ph.C., F.C.S., London.

Hon. General Secretaries.—W. A. H. Naylor, F.I.C., F.C.S., London; F. Ransom, Ph.C., F.C.S., Hitchin.

Other Members of the Executive Committee.—Leo Atkinson, Ph.C., London; F. C. J. Bird, London; H. Collier, Ph.C., London; E. H. Farr, F.C.S., Uckfield; Professor Greenish, F.I.C., F.C.S., London; P. Kelly, M.P.S.I., Dublin; E. Saville Peck, M.A., Cambridge; W. Warren, London; Edmund White, B.Sc., London.

Auditors.—J. H. Mathews, London; G. H. Grindley, Dublin.

VOTES OF THANKS.

Mr. S. R. ATKINS moved a cordial vote of thanks to Mr. Martindale, Chairman; Mr. Harrington, Vice-Chairman; Mr. Mathews,

the Treasurer; Messrs. Warren and Cracknell, the Hon. Corresponding Secretaries; and the other members of the Local Committee for their most successful efforts in organizing the present meeting.

Dr. SYMES seconded the motion, which was at once carried unanimously, and responded to by Mr. MARTINDALE and Mr. WARREN.

Mr. W. C. ALLEN next moved a vote of thanks to the President and Council of the Pharmaceutical Society of Great Britain for their kindness in granting the use of the Society's House for the Conference meetings.

Dr. MCWALTER seconded the motion, which was at once carried unanimously.

Mr. NEWSHOLME (President of the Pharmaceutical Society) responded, saying it had given the Council very great pleasure to welcome the Conference there, and he hoped another meeting would be held in London before another twenty-six years had passed.

Mr. MARTINDALE then moved a cordial vote of thanks to the President for his services during the year, and for his conduct of the business of the meetings.

Mr. G. C. DRUCE warmly seconded the motion, which was carried by acclamation.

The PRESIDENT, in reply, said: It was with many misgivings as to my ability to conduct the proceedings of your meetings as Chairman that I undertook the duties under the kindly pressure to which I was subjected by my friends last year. It is very gratifying to me to learn that my work has given satisfaction, and that I am discharged without any stain upon my character as President. Any deficiencies I have shown, I know my successor and friend of many years will do his best to make up for during the ensuing year. Although a botanist like myself, he has far more experience in ceremonial and civic procedure. Although I have done my best to improve the finances of the Conference, I have not succeeded to my satisfaction; but I hope that under his business knowledge and experience the Conference will take a new lease of life, and form a most valuable support to pharmacy both inside and outside of the Society. One thing is certain, that such measure of success as the present Conference has achieved is due almost entirely to the help I have received from the two Honorary Secretaries, who have spared neither time nor trouble, nor even personal expense, to carry out the work of the Conference efficiently. I propose, there-

fore, that a hearty vote of thanks be given to the Honorary General Secretaries (Mr. W. A. H. Naylor and Mr. F. Ransom), to whose efforts the success of the meetings was mainly due.

Mr. S. R. Atkins said he would put the President's suggestion into a concrete form by proposing a hearty vote of thanks to Messrs. Naylor and Ransom, the Hon. Secretaries, and Mr. Umney, the Hon. Treasurer.

Mr. W. G. Cross seconded the motion, which was supported by Dr. Attfield, and carried by acclamation.

Mr. Naylor, Mr. Ransom, and Mr. Umney having briefly responded, the proceedings terminated.

RECEPTION AND CONVERSAZIONE.

The reception by the President and Mrs. E. M. Holmes was held in the Banqueting Hall of the Whitehall Rooms, on Monday, July 23rd. A large company of members and their friends assembled during the evening, and the opportunity of renewing many old acquaintanceships was evidently appreciated. An excellent programme of instrumental music was provided by the Lawler Quintette, and the efforts of some accomplished vocalists in the adjoining hall were equally attractive.

BALLAD CONCERT.

In place of the usual smoking concert and ladies' drawing room, which has during recent years been held on the Wednesday evening, a ballad concert and dance were arranged for the evening of July 25th, when the serious business of the Conference had terminated. To judge from the large attendance, and the evident marks of appreciation, the change was not unwelcome. The musical programme was of exceptional excellence, and provided a treat to all who had the good fortune to be present. The dance which followed was also well patronised. The evening's innovation, if such it may be called, was evidently approved by members and their friends.

THE EXCURSION.

The intense heat, which had made the Metropolis oppressive on the previous day, gave place to a more genial temperature on Thursday, July 26th. A large company assembled at Paddington Station at 10 a.m. to travel by the special train provided to convey the party to Henley, which was reached after about an hour's rapid and comfortable journey. Two large pleasure barges and a steam launch awaited the arrival of the train, and in a short time these were well loaded with passengers, and a start was made. The trip down the river from Henley to Maidenhead affords an opportunity of becoming acquainted with some of the most beautiful reaches of the Thames and with the perfect weather which prevailed no more enjoyable excursion could have been arranged. Luncheon and tea were provided on board, and on arrival at Maidenhead a sumptuous dinner was found prepared at Skindle's Hotel. At the conclusion of the repast, the usual toasts were drunk with enthusiasm, and the Local Executive and Ladies' Committees were warmly thanked for the foresight and care to which the success of the programme was due. At the conclusion of the proceedings the company walked or drove to Taplow Station, whence a rapid return journey was made to Paddington.

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CALENDAR FOR 1900.

JANUARY.							FEBRUARY.							MARCH.						
S	...	7	14	21	28		S	...	4	11	18	25		S	...	4	11	18	25	
M	1	8	15	22	29		M	...	5	12	19	26		M	...	5	12	19	26	
Tu	2	9	16	23	30		Tu	...	6	13	20	27		Tu	...	6	13	20	27	
W	3	10	17	24	31		W	...	7	14	21	28		W	...	7	14	21	28	
Th	4	11	18	25	...		Th	1	8	15	22	...		Th	1	8	15	22	29	
F	5	12	19	26	...		F	2	9	16	23	...		F	2	9	16	23	30	
S	6	13	20	27	...		S	3	10	17	24	...		S	3	10	17	24	31	

APRIL.							MAY.							JUNE.						
S	1	8	15	22	29		S	...	6	13	20	27		S	...	3	10	17	24	
M	2	9	16	23	30		M	...	7	14	21	28		M	...	4	11	18	25	
Tu	3	10	17	24	...		Tu	1	8	15	22	29		Tu	...	5	12	19	26	
W	4	11	18	25	...		W	2	9	16	23	30		W	...	6	13	20	27	
Th	5	12	19	26	...		Th	3	10	17	24	31		Th	...	7	14	21	28	
F	6	13	20	27	...		F	4	11	18	25	...		F	1	8	15	22	29	
S	7	14	21	28	...		S	5	12	19	26	...		S	2	9	16	23	30	

JULY.							AUGUST.							SEPTEMBER.						
S	1	8	15	22	29		S	...	5	12	19	26		S	...	2	9	16	23	30
M	2	9	16	23	30		M	...	6	13	20	27		M	...	3	10	17	24	...
Tu	3	10	17	24	31		Tu	...	7	14	21	28		Tu	...	4	11	18	25	...
W	4	11	18	25	...		W	1	8	15	22	29		W	...	5	12	19	26	...
Th	5	12	19	26	...		Th	2	9	16	23	30		Th	...	6	13	20	27	...
F	6	13	20	27	...		F	3	10	17	24	31		F	...	7	14	21	28	...
S	7	14	21	28	...		S	4	11	18	25	...		S	1	8	15	22	29	...

OCTOBER.							NOVEMBER.							DECEMBER.						
S	...	7	14	21	28		S	...	4	11	18	25		S	...	2	9	16	23	30
M	1	8	15	22	29		M	...	5	12	19	26		M	...	3	10	17	24	31
Tu	2	9	16	23	30		Tu	...	6	13	20	27		Tu	...	4	11	18	25	...
W	3	10	17	24	31		W	...	7	14	21	28		W	...	5	12	19	26	...
Th	4	11	18	25	...		Th	1	8	15	22	29		Th	...	6	13	20	27	...
F	5	12	19	26	...		F	2	9	16	23	30		F	...	7	14	21	28	...
S	6	13	20	27	...		S	3	10	17	24	...		S	1	8	15	22	29	...

CALENDAR FOR 1901.

JANUARY.						
S	...	6	13	20	27	
M	...	7	14	21	28	
Tu	1	8	15	22	29	
W	2	9	16	23	30	
Th	3	10	17	24	31	
F	4	11	18	25	...	
S	5	12	19	26	...	

FEBRUARY.						
S	...	3	10	17	24	
M	...	4	11	18	25	
Tu	...	5	12	19	26	
W	...	6	13	20	27	
Th	...	7	14	21	28	
F	1	8	15	22	...	
S	2	9	16	23	...	

MARCH.							
S	...	3	10	17	24	31	
M	...	4	11	18	25	...	
Tu	...	5	12	19	26	...	
W	...	6	13	20	27	...	
Th	...	7	14	21	28	...	
F	1	8	15	22	29	...	
S	2	9	16	23	30	...	

APRIL.						
S	...	7	14	21	28	
M	1	8	15	22	29	
Tu	2	9	16	23	30	
W	3	10	17	24	...	
Th	4	11	18	25	...	
F	5	12	19	26	...	
S	6	13	20	27	...	

MAY.						
S	...	5	12	19	26	
M	...	6	13	20	27	
Tu	...	7	14	21	28	
W	1	8	15	22	29	
Th	2	9	16	23	30	
F	3	10	17	24	31	
S	4	11	18	25	...	

JUNE.						
S	...	2	9	16	23	30
M	...	3	10	17	24	...
Tu	...	4	11	18	25	...
W	...	5	12	19	26	...
Th	...	6	13	20	27	...
F	...	7	14	21	28	...
S	1	8	15	22	29	...

JULY.						
S	...	7	14	21	28	
M	1	8	15	22	29	
Tu	2	9	16	23	30	
W	3	10	17	24	31	
Th	4	11	18	25	...	
F	5	12	19	26	...	
S	6	13	20	27	...	

AUGUST.						
S	...	4	11	18	25	
M	...	5	12	19	26	
Tu	...	6	13	20	27	
W	...	7	14	21	28	
Th	1	8	15	22	29	
F	2	9	16	23	30	
S	3	10	17	24	31	

SEPTEMBER.						
S	1	8	15	22	29	
M	2	9	16	23	30	
Tu	3	10	17	24	...	
W	4	11	18	25	...	
Th	5	12	19	26	...	
F	6	13	20	27	...	
S	7	14	21	28	...	

OCTOBER.						
S	...	6	13	20	27	
M	...	7	14	21	28	
Tu	1	8	15	22	29	
W	2	9	16	23	30	
Th	3	10	17	24	31	
F	4	11	18	25	...	
S	5	12	19	26	...	

NOVEMBER.						
S	...	3	10	17	24	
M	...	4	11	18	25	
Tu	...	5	12	19	26	
W	...	6	13	20	27	
Th	...	7	14	21	28	
F	1	8	15	22	29	
S	2	9	16	23	30	

DECEMBER.						
S	1	8	15	22	29	
M	2	9	16	23	30	
Tu	3	10	17	24	31	
W	4	11	18	25	...	
Th	5	12	19	26	...	
F	6	13	20	27	...	
S	7	14	21	28	...	

Average Limits of Specific Gravities of Tinctures, B.P., 1898.

Name of Tincture.	Specific Gravity at 15° C.
Tinct. Aconiti	·890– ·895
„ Aloes	·970– ·975
„ Arnicæ	·890– ·895
„ Asafetidæ	·910– ·915
„ Aurantii recentis	·875– ·885
„ Belladonnæ	·910– ·915
„ Benzoin Co.	·890– ·900
„ Buchu	·925– ·930
„ Calumbæ	·915– ·920
„ Camphoræ Co.	·915 - ·920
„ Cannabis Indicæ	·845– ·850
„ Cantharidis	·835– ·840
„ Capsici	·890– ·895
„ Cardamomi Co.	·945– ·950
„ Cascarillæ	·895– ·900
„ Catechu	·975– ·980
„ Chiratæ	·920– ·925
„ Chloroform et Morphinæ Co.	1·010–1·015
„ Cimicifugæ	·925– ·930
„ Cinchonæ	·915– ·920
„ „ Co.	·915– ·920
„ Cinnamomi	·900– ·905
„ Cocci	·950– ·955
„ Colchici Sem.	·950– ·955
„ Conii	·895– ·900
„ Croci	·925– ·930
„ Cubebæ	·840– ·845
„ Digitalis	·930– ·935
„ Ergotæ Ammon.	·930– ·935
„ Ferri Perchloridi	1·085–1·088
„ Gelsemii	·920– ·925
„ Gentianæ Co.	·965– ·970
„ Guaiaci Ammon.	·895– ·900
„ Hamamelidis	·947– ·952
„ Hydrastis	·920– ·925
„ Hyoscyami	·950– ·955
„ Iodi	·875– ·880
„ Jaborandi	·950– ·955
„ Jalapæ	·905– ·910

manipulation of alcoholic liquids. Considerable heat is developed on mixing alcohol and water, and when it is remembered that the temperature of the liquid may from this cause be raised by as much as 9° C. (16°·2 F.) the advantage of knowing the exact quantities which will, after contraction has taken place, produce a given volume at 15°·5 C. is very evident. In the second division of the table the proportions for mixing by weight to obtain a product of one gallon, or one litre, are indicated. During

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accurate, bu

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Name of Tincture.	Specific Gravity at 15° C.
Tinct. Kino	·995–1·000
„ Krameriæ	·935– ·940
„ Lavandulæ Co.	·835– ·840
„ Limonis	·875– ·885
„ Lobeliæ Ætheria	·815– ·820
„ Lupuli	·935– ·940
„ Myrrhæ	·845– ·855
„ Nucis Vomicæ	·910– ·915
„ Opii	·950– ·965
„ „ Ammon.	·895– ·900
„ Podophylli	·845– ·850
„ Pruni Virg.	·935– ·940
„ Pyrethri	·900– ·905
„ Quassiæ	·945– ·950
„ Quillaiæ	·920– ·925
„ Quininæ	·885– ·895
„ „ Ammon.	·925– ·930
„ Rhei Co.	·970– ·975
„ Scillæ	·960– ·970
„ Senegæ	·935– ·940
„ Sennæ Co.	·985– ·995
„ Serpentariæ	·895– ·900
„ Stramonii	·955– ·960
„ Strophanthi	·890– ·895
„ Sumbul	·900– ·905
„ Tolutanæ	·860– ·865
„ Valerianæ Ammon.	·940– ·945
„ Zingiberis	·840– ·845

Table for Conversion of Grains into Grams.

Grns.	Grms.	Grns.	Grms.	Grns.	Grms.	Grns.	Grms.
1	·0648	54	3·4991	103	6·6743	152	9·8494
2	·1296	55	3·5639	104	6·7391	153	9·9142
3	·1944	56	3·6287	105	6·8039	154	9·9790
4	·3240	57	3·6935	106	6·8687	155	10 0438
6	·3888	58	3·7583	107	6·9335	156	10·1086
7	·4536	59	3·8231	108	6·9983	157	10·1734
8	·5184	60	3·8879	109	7·0631	158	10·2382
10	·6480	61	3·9527	110	7·1279	159	10·3030
11	·7128	62	4·0175	111	7·1927	160	10·3678
12	·7776	63	4·0823	112	7·2575	161	10·4326
13	·8424	64	4·1471	113	7·3223	162	10·4974
15	·9720	65	4·2119	114	7·3871	163	10·5622
16	1·0368	66	4·2767	115	7·4519	164	10·6270
17	1·1016	67	4·3415	116	7·5177	165	10·6918
18	1·1664	68	4·4063	117	7·5815	166	10·7566
20	1·2960	69	4·4711	118	7·6463	167	10·8214
21	1·3608	70	4 5359	119	7·7111	168	10·8862
22	1·4256	71	4·6007	120	7·7759	169	10·9510
23	1·4904	72	4·6655	121	7·8407	170	11·0158
24	1·5552	73	4·7303	122	7·9055	171	11·0806
25	1·6200	74	4·7951	123	7·9703	172	11·1454
26	1·6848	75	4·8599	124	8·0351	173	11·2102
27	1·7496	76	4·9247	125	8·0999	174	11·2750
28	1·8144	77	4·9895	126	8·1647	175	11·3398
29	1·8792	78	5·0543	127	8·2295	176	11·4046
30	1·9440	79	5·1191	128	8·2943	177	11·4694
31	2·0088	80	5·1839	129	8·3591	178	11·5342
32	2·0736	81	5·2487	130	8·4239	179	11·5990
33	2·1384	82	5·3135	131	8·4887	180	11·6638
34	2·2032	83	5·3783	132	8·5536	181	11·7286
35	2·2680	84	5·4431	133	8·6183	182	11·7934
36	2·3328	85	5·5079	134	8·6831	183	11·8582
37	2·3976	86	5·5727	135	8·7479	184	11·9230
38	2·4624	87	5·6375	136	8·8127	185	11·9878
39	2·5272	88	5·7023	137	8·8775	186	12·0526
40	2·5920	89	5·7671	138	8·9422	187	12·1174
41	2·6568	90	5·8319	139	9·0070	188	12·1822
42	2·7215	91	5·8967	140	9·0718	189	12·2470
43	2·7863	92	5·9615	141	9·1366	190	12·3118
44	2·8511	93	6·0263	142	9·2104	200	12·9598
45	2·9159	94	6·0911	143	9·2662	250	16·1997
46	2 9807	95	6·1559	144	9·3310	300	19·4397
47	3·0455	96	6·2207	145	9·3958	400	25·9196
48	3·1103	97	6·2855	146	9·4606	500	32·3995
49	3·1751	98	6·3503	147	9·5254	600	38·8794
50	3·2399	99	6·4151	148	9·5902	700	45·3593
51	3·3047	100	6·4799	149	9·6550	800	51·8392
52	3·3695	101	6·5447	150	9·7198	900	58·3190
53	3·4343	102	6·6095	151	9·7846	1000	64·7989

Conversion of Thermometric Scales.

Table I.

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
400	204·4	348	175·6	296	146·7	244	117·8
399	203·9	347	175·0	295	146·1	243	117·2
398	203·3	346	174·4	294	145·6	242	116·7
397	202·8	345	173·9	293	145·0	241	116·1
396	202·2	344	173·3	292	144·4	240	115·6
395	201·7	343	172·8	291	143·9	239	115·0
394	201·1	342	172·2	290	143·3	238	114·4
393	200 6	341	171·7	289	142·8	237	113 9
392	200·0	340	171·1	288	142·2	236	113·3
391	199·4	339	170·6	287	141·7	235	112·8
390	198 9	338	170·0	286	141·1	234	112·2
389	198·3	337	169·4	285	140·6	233	111·7
388	197·8	336	168·9	284	140·0	232	111·1
387	197·2	335	168·3	283	139·4	231	110·6
386	196·7	334	167·8	282	138·9	230	110·0
385	196·1	333	167·2	281	138·3	229	109·4
384	195·6	332	166·7	280	137·8	228	108·9
383	195·0	331	166·1	279	137·2	227	108·3
382	194 4	330	165·6	278	136·7	226	107·8
381	193·9	329	165·0	277	136·1	225	107·2
380	193·3	328	164·4	276	135·6	224	106·7
379	192·8	327	163·9	275	135·0	223	106·1
378	192·2	326	163·3	274	134·4	222	105·6
377	191·7	325	162·8	273	133·9	221	105·0
376	191·1	324	162·2	272	133·3	220	104·4
375	190·6	323	161·7	271	132·8	219	103·9
374	190·0	322	161·1	270	132·2	218	103·3
373	189·4	321	160·6	269	131·7	217	102·8
372	188·9	320	160·0	268	131·1	216	102·2
371	188·3	319	159·4	267	130·6	215	101·7
370	187·8	318	158·9	266	130·0	214	101·1
369	187·2	317	158·3	265	129·4	213	100·6
368	186·7	316	157·8	264	128·9	212	100·0
367	186·1	315	157·2	263	128·3	211	99·4
366	185·6	314	156·7	262	127·8	210	98·9
365	185·0	313	156·1	261	127·2	209	98·3
364	184·4	312	155·6	260	126·7	208	87·9
363	183·9	311	155·0	259	126·1	207	97·2
362	183·3	310	154·4	258	125·6	206	96·7
361	182·8	309	153·9	257	125 0	205	96·1
360	182·2	308	153·3	256	124·4	204	95·6
359	181·7	307	152·8	255	123·9	203	95·0
358	181·1	306	152·2	254	123·3	202	94·4
357	180·6	305	151·7	253	122·8	201	93·9
356	180 0	304	151·1	252	122·2	200	93·3
355	179·4	303	150·6	251	121·7	199	92·8
354	178·9	302	150 0	250	121·1	198	92·2
353	178·3	301	149·4	249	120·6	197	91·7
352	177·8	300	148·9	248	120·0	196	91·1
351	177·2	299	148·3	247	119·4	195	90 6
350	176·7	298	147·8	246	118 9	194	90 0
349	176·1	297	147·2	245	118·3	193	89·4

Conversion of Thermometric Scales (*continued*).

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
192	88·9	136	57·8	80	26·7	24	4·4
191	88·3	135	57·2	79	26·1	23	5·0
190	87·8	134	56·7	78	25·6	22	5·6
189	87·2	133	56·1	77	25·0	21	6·1
188	86·7	132	55·6	76	24·4	20	6·7
187	86·1	131	55·0	75	23·9	19	7·2
186	85·6	130	54·4	74	23·3	18	7·8
185	85·0	129	53·9	73	22·8	17	8·3
184	84·4	128	53·3	72	22·2	16	8·9
183	83·9	127	52·8	71	21·7	15	9·5
182	83·3	126	52·2	70	21·1	14	10·0
181	82·8	125	51·7	69	20·6	13	10·6
180	82·2	124	51·1	68	20·0	12	11·1
179	81·7	123	50·6	67	19·4	11	11·7
178	81·1	122	50·0	66	18·9	10	12·2
177	80·6	121	49·4	65	18·3	9	12·8
176	80·0	120	48·9	64	17·8	8	13·3
175	79·4	119	48·3	63	17·2	7	13·9
174	78·9	118	47·8	62	16·7	6	14·4
173	78·3	117	47·2	61	16·1	5	15·0
172	77·8	116	46·7	60	15·6	4	15·6
171	77·2	115	46·1	59	15·0	3	16·1
170	76·7	114	45·6	58	14·4	2	16·7
169	76·1	113	45·0	57	13·9	1	17·2
168	75·6	112	44·4	56	13·3	0	17·8
167	75·0	111	43·9	55	12·8	1	18·3
166	74·4	110	43·3	54	12·2	2	18·9
165	73·9	109	42·8	53	11·7	3	19·4
164	73·3	108	42·2	52	11·1	4	20·0
163	72·8	107	41·7	51	10·6	5	20·6
162	72·2	106	41·1	50	10·0	6	21·1
161	71·7	105	40·6	49	9·4	7	21·7
160	71·1	104	40·0	48	8·9	8	22·2
159	70·6	103	39·4	47	8·3	9	22·8
158	70·0	102	38·9	46	7·8	10	23·3
157	69·4	101	38·3	45	7·2	11	23·9
156	68·9	100	37·8	44	6·7	12	24·4
155	68·3	99	37·2	43	6·1	13	25·0
154	67·8	98	36·7	42	5·6	14	25·6
153	67·2	97	36·1	41	5·0	15	26·1
152	66·7	96	35·6	40	4·4	16	26·7
151	66·1	95	35·0	39	3·9	17	27·2
150	65·6	94	34·4	38	3·3	18	27·8
149	65·0	93	33·9	37	2·8	19	28·3
148	64·4	92	33·3	36	2·2	20	28·9
147	63·9	91	32·8	35	1·7	21	29·4
146	63·3	90	32·2	34	1·1	22	30·0
145	62·8	89	31·7	33	0·6	23	30·6
144	62·2	88	31·1	32	0·0	24	31·1
143	61·7	87	30·6	31	0·6	25	31·7
142	61·1	86	30·0	30	1·1	26	32·2
141	60·6	85	29·4	29	1·7	27	32·8
140	60·0	84	28·9	28	2·2	28	33·3
139	59·4	83	28·3	27	2·8	29	33·9
138	58·9	82	27·8	26	3·3	30	34·4
137	58·3	81	27·2	25	3·9	31	35·0

TABLE SHOWING THE VALUE OF 1 LB. AND 1 CWT. IN ENGLISH MONEY WHEN THE ARTICLE IS QUOTED PER KILO IN FRANCS.

If 1 kilo costs		1 lb. will cost			1 cwt. will cost			If 1 kilo costs		1 lb. will cost			1 cwt. will cost		
Fr.	cts.	£	s.	d.	£	s.	d.	Fr.	cts.	£	s.	d.	£	s.	d.
–	5	–	–	–¼	–	2	0½	2	50	–	–	10⅞	5	1	7¼
–	10	–	–	–½	–	4	0¾	2	55	–	–	11⅛	5	3	7¾
–	15	–	–	–⅝	–	6	1¼	2	60	–	–	11⅜	5	5	8
–	20	–	–	–¾	–	8	1½	2	65	–	–	11½	5	7	8¼
–	25	–	–	1⅛	–	10	2	2	70	–	–	11¾	5	9	8¾
–	30	–	–	1⅜	–	12	2½	2	75	–	1	0	5	11	9
–	35	–	–	1½	–	14	2¾	2	80	–	1	0¼	5	13	9½
–	40	–	–	1¾	–	16	3	2	85	–	1	0⅜	5	15	9¾
–	45	–	–	2	–	18	3¼	2	90	–	1	0½	5	17	10¼
–	50	–	–	2¼	1	0	3½	2	95	–	1	0⅝	5	19	10¾
–	55	–	–	2⅜	1	2	4¼	3	0	–	1	1⅛	6	1	11¼
–	60	–	–	2⅝	1	4	4½	3	5	–	1	1¼	6	3	11½
–	65	–	–	2⅞	1	6	5	3	10	–	1	1½	6	5	11¾
–	70	–	–	3⅛	1	8	5	3	15	–	1	1¾	6	8	0¼
–	75	–	–	3¼	1	10	5¾	3	20	–	1	1⅞	6	10	0¾
–	80	–	–	3½	1	12	6¼	3	25	–	1	2⅛	6	12	1
–	85	–	–	3¾	1	14	6½	3	30	–	1	2⅜	6	14	1½
–	90	–	–	3⅞	1	16	7	3	35	–	1	2⅝	6	16	1¾
–	95	–	–	4⅛	1	18	7¼	3	40	–	1	2¾	6	18	2¼
1	0	–	–	4⅜	2	0	7¼	3	45	–	1	3	7	0	2¾
1	5	–	–	4⅝	2	2	8¼	3	50	–	1	3¼	7	2	3
1	10	–	–	4¾	2	4	8½	3	55	–	1	3½	7	4	3¼
1	15	–	–	5	2	6	8¾	3	60	–	1	3⅝	7	6	3½
1	20	–	–	5¼	2	8	9	3	65	–	1	3⅞	7	8	4
1	25	–	–	5½	2	10	9½	3	70	–	1	4⅛	7	10	4½
1	30	–	–	5⅝	2	12	10	3	75	–	1	4⅜	7	12	4¾
1	35	–	–	5⅞	2	14	10¼	3	80	–	1	4½	7	14	5¼
1	40	–	–	6⅛	2	16	10¾	3	85	–	1	4¾	7	16	5½
1	45	–	–	6⅜	2	18	11	3	90	–	1	5	7	18	6
1	50	–	–	6½	3	0	11½	3	95	–	1	5¼	8	0	6½
1	55	–	–	6¾	3	3	0	4	0	–	1	5⅜	8	2	7
1	60	–	–	7	3	5	0¼	4	5	–	1	5½	8	4	7½
1	65	–	–	7¼	3	7	0¾	4	10	–	1	5⅞	8	6	7¾
1	70	–	–	7⅜	3	9	1	4	15	–	1	6⅛	8	8	8
1	75	–	–	7⅝	3	11	1½	4	20	–	1	6¼	8	10	8½
1	80	–	–	7⅞	3	13	2	4	25	–	1	6½	8	12	8¾
1	85	–	–	8⅛	3	15	2¼	4	30	–	1	6¾	8	14	9
1	90	–	–	8¼	3	17	2¾	4	35	–	1	6⅞	8	16	9½
1	95	–	–	8½	3	19	3	4	40	–	1	7⅛	8	18	9¾
2	0	–	–	8¾	4	1	3¼	4	45	–	1	7⅜	9	0	10¼
2	5	–	–	8⅞	4	3	3¾	4	50	–	1	7⅝	9	2	10½
2	10	–	–	9⅛	4	5	4	4	55	–	1	7¾	9	4	11
2	15	–	–	9⅜	4	7	4¼	4	60	–	1	8	9	6	11½
2	20	–	–	9⅝	4	9	4¾	4	65	–	1	8¼	9	8	11¾
2	25	–	–	9¾	4	11	5¼	4	70	–	1	8½	9	11	0¼
2	30	–	–	10	4	13	5¾	4	75	–	1	8⅝	9	13	0½
2	35	–	–	10¼	4	15	6	4	80	–	1	8⅞	9	15	1
2	40	–	–	10½	4	17	6½	4	85	–	1	9⅛	9	17	1½
2	45	–	–	10⅝	4	19	7	4	90	–	1	9⅜	9	19	1¾

TABLE SHOWING THE VALUE OF 1 LB. AND 1 CWT. IN ENGLISH MONEY WHEN THE ARTICLE IS QUOTED PER KILO IN FRANCS (*continued*).

If 1 kilo costs	1 lb. will cost	1 cwt. will cost	If 1 kilo costs	1 lb. will cost	1 cwt. will cost
Fr. cts.	£ s. d.	£ s. d.	Fr. cts.	£ s. d.	£ s. d.
4 95	– 1 9½	10 1 2¼	8 80	– 3 2¼	17 17 7¾
5 0	– 1 9¾	10 3 2½	8 90	– 3 2⅝	18 1 8¾
5 10	– 1 10¼	10 7 3¼	9 0	– 3 3⅛	18 5 9¼
5 20	– 1 10⅝	10 11 4	9 10	– 3 3⅜	18 9 10
5 30	– 1 11⅛	10 15 4¾	9 20	– 3 4	18 13 10¾
5 40	– 1 11½	10 19 5½	9 30	– 3 4½	18 17 11½
5 50	– 1 11⅞	11 3 6¼	9 40	– 3 4⅞	19 2 0½
5 60	– 2 0⅜	11 7 7¼	9 50	– 3 5⅜	19 6 1¼
5 70	– 2 0¾	11 11 8	9 60	– 3 5¾	19 10 2
5 80	– 2 1¼	11 15 8¾	9 70	– 3 6¼	19 14 2¾
5 90	– 2 1⅝	11 19 9¼	9 80	– 3 6⅝	19 18 3¼
6 0	– 2 2⅛	12 3 10¼	9 90	– 3 7⅛	20 2 4¼
6 10	– 2 2½	12 7 11	10 –	– 3 7½	20 6 5
6 20	– 2 3	12 11 11¾	11 –	– 3 11⅝	22 7 0¾
6 30	– 2 3⅜	12 16 0½	12 –	– 4 4¼	24 7 8½
6 40	– 2 3⅞	13 0 1¼	13 –	– 4 8⅝	26 8 4
6 50	– 2 4¼	13 4 2½	14 –	– 5 1	28 9 0
6 60	– 2 4¾	13 8 2¾	15 –	– 5 5¼	30 9 7½
6 70	– 2 5⅛	13 12 3½	16 –	– 5 9⅜	32 10 3¼
6 80	– 2 5⅝	13 16 4¼	17 –	– 6 2	34 10 11
6 90	– 2 6	14 0 5	18 –	– 6 6⅜	36 11 6½
7 0	– 2 6½	14 4 6	19 –	– 6 10¾	38 12 2¼
7 10	– 2 6⅞	14 8 6¾	20 –	– 7 3	40 12 10
7 20	– 2 7⅜	14 12 7½	30 –	– 10 10⅝	60 19 3
7 30	– 2 7¾	14 16 8¼	40 –	– 14 6⅛	81 5 8
7 40	– 2 8¼	15 0 9	50 –	– 18 1⅝	101 12 1
7 50	– 2 8⅝	15 4 9¾	60 –	1 1 9¼	121 18 6
7 60	– 2 9⅛	15 8 10½	70 –	1 5 4¾	142 4 11
7 70	– 2 9½	15 12 11¼	80 –	1 9 0⅜	162 11 4
7 80	– 2 9⅞	15 17 0¼	90 –	1 12 7⅞	182 17 9
7 90	– 2 10⅜	16 1 0¾	100 –	1 16 3½	203 4 2
8 0	– 2 10¾	16 5 1¾	200 –	3 12 7	406 8 4
8 10	– 2 11¼	16 9 2½	300 –	5 8 10½	609 12 7
8 20	– 2 11⅝	16 13 3	400 –	7 5 1¾	812 16 9
8 30	– 3 0⅛	16 17 3¾	500 –	9 1 5¼	1016 0 11
8 40	– 3 0½	17 1 4¾	600 –	10 17 8¾	1219 5 2
8 50	– 3 1	17 5 5½	700 –	12 14 0	1422 9 4
8 60	– 3 1⅜	17 9 6¼	1000 –	18 2 10½	2032 1 11
8 70	– 3 1⅞	17 13 7			

TABLE SHOWING EQUIVALENT RATES PER LB. AND CWT.

Per lb.	Per cwt.		Per lb.	Per cwt.		Per lb.	Per cwt.	
d.	*s.*	*d.*	*d.*	*s.*	*d.*	*d.*	*s.*	*d.*
$\frac{1}{4}$	2	4	$4\frac{1}{4}$	39	8	$8\frac{1}{4}$	77	0
$\frac{1}{2}$	4	8	$4\frac{1}{2}$	42	0	$8\frac{1}{2}$	79	4
$\frac{3}{4}$	7	0	$4\frac{3}{4}$	44	4	$8\frac{3}{4}$	81	8
1	9	4	5	46	8	9	84	0
$1\frac{1}{4}$	11	8	$5\frac{1}{4}$	49	0	$9\frac{1}{4}$	86	4
$1\frac{1}{2}$	14	0	$5\frac{1}{2}$	51	4	$9\frac{1}{2}$	88	8
$1\frac{3}{4}$	16	4	$5\frac{3}{4}$	53	8	$9\frac{3}{4}$	91	0
2	18	8	6	56	0	10	93	4
$2\frac{1}{4}$	21	0	$6\frac{1}{4}$	58	4	$10\frac{1}{4}$	95	8
$2\frac{1}{2}$	23	4	$6\frac{1}{2}$	60	8	$10\frac{1}{2}$	98	0
$2\frac{3}{4}$	25	8	$6\frac{3}{4}$	63	0	$10\frac{3}{4}$	100	0
3	28	0	7	65	4	11	102	8
$3\frac{1}{4}$	30	4	$7\frac{1}{4}$	67	8	$11\frac{1}{4}$	105	0
$3\frac{1}{2}$	32	8	$7\frac{1}{2}$	70	0	$11\frac{1}{2}$	107	4
$3\frac{3}{4}$	35	0	$7\frac{3}{4}$	72	4	$11\frac{3}{4}$	109	8
4	37	4	8	74	8	12	112	0

PHARMACY AND POISON LAWS OF GREAT BRITAIN AND IRELAND.

GREAT BRITAIN.

The Arsenic Act, 1851, recites conditions for the sale of white arsenic.

The Pharmacy Act, 1852, gave the Pharmaceutical Society of Great Britain power to hold examinations and grant title of pharmaceutical chemist.

The Pharmacy Act, 1868, comprises regulations for the sale of poisons and registration of retailers and dispensers of same.

The Pharmacy Act, 1869, amends provisions of 1868 Act in the case of medical practitioners and veterinary surgeons.

The Pharmacy Act, 1898, enables chemists and druggists to become members of the Pharmaceutical Society.

SCHEDULE OF POISONS.
PART 1.

The poisons named in this part may not be sold by retail unless:

(1) The purchaser be known to the seller, or be introduced by a person known to the seller also.

(2) Each sale be entered in the poison book as follows: (*a*) date of sale; (*b*) name and address of purchaser; (*c*) name and quantity of poison sold;

IRELAND.

The Arsenic Act, 1851.

Sale of Poisons Act (Ireland), 1870, relates to the sale of poisons and adulteration.

Pharmacy Act (Ireland), 1875, creates the Pharmaceutical Society of Ireland, and provides for registration of dispensers and retailers of poisons.

Pharmacy Act (Ireland), 1875, Amendment Act, 1890, creates registered druggists.

Statute-Law Revision (No. 2) Act, 1893, repeals a few minor enactments of the Acts 1870 and 1875.

SCHEDULE OF POISONS.
PART 1.

Same as in Great Britain.

GREAT BRITAIN.	IRELAND.
SCHEDULE OF POISONS (*continued*).	
(*d*) purpose for which it is stated to be required; (*e*) signature of the purchaser, and introducer, if any (Arsenic, *vide* p. 545). (3) The poison sold must be labelled with (*f*) the name of the article; (*g*) the word "Poison"; (*h*) the name and address of the seller.	
Aconite and its preparations. Arsenic and its preparations. Atropine and its preparations. Cantharides. Corrosive sublimate. Cyanide of potassium and all metallic cyanides. Emetic tartar. Ergot of rye and its preparations. Prussic acid. Savin and its oil. Strychnine. All poisonous vegetable alkaloids and their salts.	Same as in Great Britain.
PART 2.	PART 2.
The poisons named in this part may not be sold by retail unless labelled with (*a*) the name of the article; (*b*) the word "poison"; (*c*) the name and address of the seller.	Same as in Great Britain.
Ammoniated mercury (commonly known as white precipitate of mercury). Belladonna and its preparations. Cantharides, tincture and all vesicating liquid preparations of. Liquid preparations of carbolic acid and its homologues containing more than 3 per cent. of those substances, except any preparation used as a sheepwash or for any other purpose in connection with agriculture or horticulture. Chloral hydrate and its preparations. Chloroform. Corrosive sublimate, preparations of. Essential oil of almonds, unless deprived of its prussic acid. Morphine, preparations of. Nux vomica and its preparations. Opium and all preparations of opium or of poppies. Oxalic acid. Phenol and its homologues (liquid preparations containing more than 3 per cent.). Red oxide of mercury (commonly known as red precipitate of mercury). Vermin-killers, *i.e.*, "every compound containing any poison within the meaning of the Pharmacy Act, 1868, when prepared or sold for the destruction of vermin."	Same as in Great Britain, with the following additions. Sulphuric ether. Phosphorus, and all preparations containing it in a free state. Preparations of strychnine. Biniodide of mercury.

POSTAL REGULATIONS.

PRINCIPAL POST-OFFICE CHARGES.

Letter Post.

Inland.—Not exceeding 4 oz. . . . . 1*d.*
For every additional 2 oz. . . . . ½*d.*
Postcard . . . . . ½*d.*

Colonial and Foreign.—To undermentioned British Possessions and Protectorates, viz.: Aden, Ascension, Bahamas, Barbados, Bermudas, British Central Africa, British East Africa, British Guiana, British Honduras, British North Borneo, Canada, Cape Colony, Ceylon, Cyprus, Falkland Islands, Fiji, Gambia, Gibraltar, Gold Coast, Hong Kong, India, Jamaica, Johore, Labuan, Lagos, Leeward Islands (viz., Antigua, St. Kitts, Nevis, Dominica, Montserrat, and the Virgin Islands), Malay States (Protected, viz., Perak, Selangor, Negri-Sembilan, and Pahang), Malta, Mauritius, Natal, Newfoundland, Niger Coast Protectorate, Niger Territory, St. Helena, Sarawak, Seychelles, Sierra Leone, Straits Settlements, Tobago, Trinidad, Turk's Islands, Windward Islands (viz., Grenada, St. Lucia, St. Vincent, and the Grenadines), and Zanzibar.

Per ½ oz. . . . . 1*d.*
Elsewhere per ½ oz. . . . . 2½*d.*
Postcard . . . . . 1*d.*

Book Post.

Inland.—Not exceeding 2 oz. . . . . ½*d.*
For every additional 2 oz. . . . . ½*d.*
Colonial and Foreign.—Per 2 oz. . . . . ½*d.*

Parcel Post.

Inland.—Not exceeding 1 lb. . . . . 3*d.*
And 1*d.* for each additional 1 lb. up to 11 lbs. which is the maximum.

Newspaper Post.

Inland.—Each registered newspaper . . . . ½*d.*
Colonial and Foreign as book post.

Telegrams.

Inland.—For first twelve words . . . . . 6*d.*
For each additional word . . . . ½*d.*

Postal Orders.

The orders are issued for fourteen amounts, upon which poundage is charged as follows:—

Amount.	*Poundage.*
1*s.*	½*d.*
1*s.* 6*d.*	½*d.*
2*s.*, 2*s.* 6*d.*, 3*s.*, 3*s.* 6*d.*, 4*s.*, 4*s.* 6*d.*, 5*s.*, 7*s.* 6*d.*, 10*s.*, 10*s.* 6*d.*,	each, 1*d.*
15*s.*, and 20*s.*,	„ 1½*d.*

Inland Money Orders.

For sums not exceeding £1	2*d.*
„ exceeding £1 and not exceeding £3	3*d.*
„ „ £3 „ „ £10	4*d.*

Money Orders for Places Abroad.

For sums not exceeding £2	6*d.*
„ exceeding £2 and not exceeding £6	1*s.*
„ „ £6 „ „ £10	1*s.* 6*d.*

Registration.

Letters, parcels, and postal packets are registered at 2*d.* to 1*s.* 2*d.* each, the compensation ranging from £5 to £120. Coins, watches, or jewellery must be registered. The letters or packets must be marked "Registered," and handed over the counter at a post office. The special post office envelopes should be used when possible.

Newspapers and Books.

The postal rate on newspapers is ½*d.* each. A packet must not exceed 5 lbs. in weight or 2 feet in length or 1 foot in width or depth. Newspaper wrappers bearing ½*d.* or 1*d.* stamps are obtainable at 4*d.* for seven or 8½*d.* for eight.

Books, if sent by book-post, must be posted either without wrapper, or in an unsealed envelope or cover so as to be easy of inspection. Size of the packet allowed is the same as for newspapers.

Commercial papers such as invoices, orders for goods, advice notes, waybills, bills of lading, receipts, statements of account, prices current, market reports, etc., are accepted for transmission at the book packet rate, conditionally upon nothing appearing in writing on the documents save dates, the names and addresses of the parties, the particulars and prices of any goods, or the particulars of any sums of money to which the document relates, and the mode of consignment of any such goods or money. Matter in the nature of a letter must be wholly in print, and must relate exclusively to the subject-matter of the document.

Circulars are also received at the book rate.

Parcels.

Limitations.—The size for an inland parcel is—

Greatest length, 3½ feet; greatest length and girth combined, 6 feet.

The maximum weight allowed for an inland parcel is 11 lbs.

Parcels to or from the Channel Islands or the Isle of Man and the

United Kingdom are liable to Customs duty on delivery if they contain anything dutiable.

Compensation up to £2 is allowed for parcels lost or damaged though not registered, under certain conditions, *but not for fragile or perishable articles.*

Colonial and Foreign Service.

Book Post.—The articles permitted to be sent at the book post rate are printed, and commercial papers similar in nature to those already described. The lowest charge for books is ½*d.*, and for commercial papers, 2½*d.*, and up to 10 oz. may be sent for the latter sum. Packets addressed to British Colonies or Possessions and non-Union countries must not exceed 2 feet long and 1 foot wide or deep, and 5 lbs. in weight. To Foreign Countries in the Postal Union the length is limited to 18 inches, and the weight to 4 lbs. A roll may be 30 inches long and 4 inches in diameter. The packets must be open for inspection.

Patterns and Samples.—Rate, 1*d.* the first 4 oz., ½*d.* for every additional 2 oz. The samples must be *bonâ fide* trade patterns or samples of merchandise, so packed as to give freedom of inspection. The limit of weight for British Colonies or Possessions or for non-Union countries is 5 lbs., and of dimensions 2 feet by 1 foot by 1 foot.

Parcels conveyed to colonial and foreign parts through the Post Office are subject to the Customs regulations of the country to which they are addressed. Declarations have to be made by the sender *on forms obtainable from the Post Office.* Generally an invoice may be enclosed in the parcel but not a letter.

Profit Assessment.

The following examples show how the questions of profits and percentages upon cost and sales can be calculated. The cost and profit figures may be taken as either pounds, shillings, pence, or farthings.

1. To find the percentage of profit on cost—

Say the cost is 8 and the profit 4.

$$4 \times 100 = 400 \div 8 = 50 \text{ per cent.}$$

2. To find the percentage of profit on sales—

Taking the same figures for cost and profit.

$$4 \times 100 = 400 \div 12\ (4+8) = 33 \text{ per cent.}$$

3. To find what amount to add to cost to realize a certain rate per cent. upon the cost—

Say the cost is 6 and the rate required 25 per cent.

$$6 \times 25 = 150 \div 100 = 1{\cdot}5\ ;$$

which may be £1 10*s.*, 1*s.* 6*d.*, or 1½*d.*

4. To find what amount to add to cost to produce a certain rate per cent. upon sales—

Say the cost is 6 and the rate 25.

$$6 \times 25 = 150 \div 75\ (100-25) = 2.$$

A Handy Table for Assessing Profits.

By adding to the cost, as follows, the relative percentages of profit are obtained:—

One half	50	per	cent.	on cost, and	33	per cent.	on sales.
„ third	33·33	„	„		25	„	„
„ fourth	25	„	„		20	„	„
„ fifth	20	„	„		16·6	„	„
„ sixth	16·6	„	„		14·28	„	„
„ seventh	14·28	„	„		12·5	„	„
„ eighth	12·5	„	„		11·11	„	„
„ ninth	11·11	„	„		10	„	„
„ tenth	10	„	„		9·09	„	„
„ eleventh	9·09	„	„		8·33	„	„
„ twelfth	8·33	„	„		7·69	„	„
„ thirteenth	7·69	„	„		7·14	„	„
„ fourteenth	7·14	„	„		6·66	„	„
„ fifteenth	6·66	„	„		6·25	„	„
„ sixteenth	6·25	„	„		5·88	„	„
„ seventeenth	5·88	„	„		5·55	„	„
„ eighteenth	5·55	„	„		5·26	„	„
„ nineteenth	5·26	„	„		5	„	„
„ twentieth	5	„	„		4·76	„	„

Relation of the Imperial to the Metric Standards.

Standards of Mass.

1 Pound=453·59243 grammes.
1 Ounce=28·34953 grammes, or 28·35 grm. nearly.
1 Grain=0·0648918 gramme, or 0·0648 grm. „

Standards of Capacity.

1 Gallon=4·5459631 litres.
1 Pint=0·5682454 litre, or 568·336 cubic centimetres nearly.
1 Fluid Ounce=0·0284123 litre, or 28·417 cubic centimetres nearly.
1 Fluid Drachm=0·003552 litre, or 3·552 cubic centimetres „
1 Minim=0·000059 litre, or 0·059 cubic centimetre nearly.

Standards of Length.

1 Yard=0·914399 metre.
1 Foot=0·30480 metre=30·48 centimetres.
1 Inch=0·02540 metre=25·40 millimetres.

SOLUBILITIES OF CHEMICALS, ETC., B.P. 1898.

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Acetanilid	1 in 200	1 in 18	1 in 4	freely soluble	freely soluble	1 in 5
Acid Arsenios	1 in 100	1 in 10				
„ Benzoic	1 in 400	1 in 17	1 in 3	1 in $2\frac{1}{2}$	1 in 7	
„ Boric	1 in 30 (?)	1 in 3	1 in 30			1 in 4
„ Carbolic	1 in 12		freely soluble	freely soluble	freely soluble	freely soluble
„ Citric	1 in $\frac{3}{4}$	1 in $\frac{1}{2}$	slightly less soluble	slightly soluble		
„ Gallic	1 in 100	1 in 3	1 in 5	1 in 40		1 in 12 (?)
„ Salicylic	1 in 500	1 in 15	1 in 3	1 in 2		1 in 200
„ Tannic	1 in 1		1 in 1			1 in 1
„ Tartaric	less than 1 in 1		less than 1 in 3			
Alum	1 in 10	1 in $\frac{1}{3}$	insoluble			freely soluble
Ammon. Benz.	1 in 6		1 in 30			1 in 8
„ Carb.	1 in 4					
„ Chloride	1 in 3		1 in 60			
„ Phosph.	1 in 4		insoluble			
Antimonium Tartaratum	1 in 17	1 in 3	almost insoluble			
Apomorph. Hydrochlor.	1 in 50		more soluble			soluble
Argent Nitras	less than 1 in 1		slightly soluble	soluble		
Atropine	1 in 300		readily soluble	readily soluble	readily soluble	
„ Sulph.	1 in 1		1 in 10	insoluble	insoluble	1 in 1
Borax	1 in 25	1 in $\frac{1}{2}$	insoluble			1 in 1
Butyl Chloral Hydrate	1 in 50		1 in 1		1 in 20	
Caffeina	1 in 80	easily soluble	easily soluble	sparingly soluble	easily soluble	
„ Citras	1 in 32					
Calcii Chlorid.	1 in 1		1 in 3			
„ Hypophos.	1 in 8		insoluble			
Camphor	1 in 700		about 1 in 1	very soluble	1 in $\frac{1}{4}$	
Chloral Hydrate	less than 1 in 1		less than 1 in 1	less than 1 in 1	1 in 4	
Cocaina	almost insoluble		1 in 10	1 in 4	1 in $\frac{1}{2}$	insoluble

Solubility of Chemicals, etc. (*continued*).

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Cocainæ Hydrochlor.	1 in ½		1 in 4	almost insoluble		1 in 4
Codeina	1 in 80		readily soluble	1 in 30	readily soluble	
„ Phosphate	1 in 4		much less soluble			
Creosote	1 in 400		freely soluble	freely soluble		
Cupri Sulph.	1 in 3½		almost insoluble			very soluble
Ferri et Ammon. Cit.	1 in ½		almost insoluble			
Ferri et Quin. Citras	1 in ½					
Ferri Sulphas	less than 1 in 2		insoluble			
Glusidum	1 in 400	1 in 24	1 in 25	slightly soluble	slightly soluble	
Homatropinæ Hydrobrom.	1 in 6		1 in 133 (absolute)			
Hyd. Perchlor.	1 in 16	1 in 2	1 in 3	1 in 4		1 in 2
Hyoscinæ Hydrobrom.	1 in 1		1 in 13	very slightly soluble	very slightly soluble	
Hyoscyaminæ Sulph.	1 in ½		1 in 2½	very slightly soluble	very slightly soluble	
Iodoform	very slightly soluble		1 in 80 cold 1 in 10 boiling	1 in 5	soluble	
Iodine	1 in 5000		freely soluble	freely soluble	freely soluble	
Lithii Carb.	1 in 70		insoluble			
„ Cit.	1 in 2					
Mag. Sulph.	1 in 1					
Morphinæ Acet.	1 in 2½		1 in about 100			
„ Hydrochlor.	1 in 24	1 in 1	1 in 50			
„ Tartras	1 in 11		almost insoluble			
Naphthol	1 in 1000	1 in 75	less than 1 in 2	very soluble	very soluble	
Paraldehyd.	1 in 10	less soluble	all proportions	all proportions		
Pepsin	moderately soluble		1 in 100			
Phenacetin	very sparingly soluble	more freely	1 in 20			
Phenazone	1 in 1		1 in 1⅓	1 in 40	1 in 1⅓	
Phosphorus	insoluble		1 in 350 (absolute)	1 in 80	1 in 25	

Solubility of Chemicals, etc. (*continued*).

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Picrotoxin	1 in 330	1 in 35	1 in 13, cold 1 in 3, boiling			
Pilocarpin Nit.	1 in 8 or 9		slightly soluble, cold freely soluble, boiling			
Plumbi Acet.	less than 1 in 3		1 in 30			
„ Iodid.	1 in 2000	1 in 200				
Pot. Caustic	1 in ½		1 in 2			
„ Acet.	1 in ½		1 in 2			
„ Bicarb.	1 in 4		almost insoluble			
„ Bichrom.	1 in 10					
„ Bromide	1 in 2		1 in 200			
„ Carb.	1 in 1		insoluble			
„ Chlor.	1 in 16	1 in 3				
„ Citras	very soluble					
„ Iodid.	less than 1 in 1		1 in 12			
„ Nitras	1 in 4	1 in ½				
„ Permang.	1 in 20					
„ Sulph.	1 in 10	1 in 4	insoluble			
„ Tart.	1 in 1					
„ „ Acid	1 in 200		insoluble			
Quin. Hydrochlor.	1 in 35	very soluble	1 in 3, cold very soluble, boiling			
„ „ Acid	less than 1 in 1					
„ Sulphas.	1 in 800					
Sacch. Lact.	1 in 7	1 in 1				
„ Purificat.	1 in ½					
Salicine	1 in 28		1 in 60	insoluble		

Solubility of Chemicals, etc. (*continued*).

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Salol	almost insoluble		1 in 10, very soluble, boiling	1 in $\frac{1}{3}$	1 in $\frac{1}{3}$	
Santonin	scarcely soluble	sparingly soluble	1 in 40, cold 1 in 3, boiling		1 in 4	
Sapo Durus	1 in 20	1 in $1\frac{1}{2}$	soluble			
Sodii Arsen.	1 in 6		slightly soluble			
„ Benz.	1 in 2		1 in 24, cold 1 in 12, boiling			
„ Bicarb.	1 in 11					
„ Bromid.	less than 1 in 2		1 in 16			
„ Carb.	1 in 2					
„ Chlorid.	less than 1 in 3					
„ Hypophos.	1 in 1		1 in 30	insoluble		
„ Iodid.	less than 1 in 1		1 in 3			
„ Phosphas	1 in 6					
„ Salicylas	less than 1 in 1		1 in 6			
„ Sulphas	1 in less than $\frac{1}{2}$ (77° to 86° F.)		insoluble			
„ Sulphocarb.	1 in 6		1 in 150			
Strychnine	very sparingly soluble		1 in 150, cold	nearly insoluble	1 in 6	
„ Hydrochlor.	1 in 35		1 in 60			
Sulphonal	1 in 450	1 in 15	1 in 50, cold very soluble, boiling	soluble		
Sulphur Iodid.	insoluble					1 in 60
Veratrine	insoluble		1 in 3	1 in 6	1 in 3	
Zinci Acet.	1 in $2\frac{1}{2}$					
„ Sulphas	less than 1 in 1					
„ Sulphocarb.	1 in 2		1 in $2\frac{1}{2}$			

Transformation of Columns of Water into Columns of Mercury.

Millim. of Water.	Millim. of Mercury.	Millim. of Water.	Millim. of Mercury.
1	·074	35	2·58
2	·15	40	2·95
3	·22	45	3·32
4	·30	50	3·69
5	·37	55	4·06
6	·44	60	4·43
7	·52	65	4·80
8	·59	70	5·17
9	·66	75	5·54
10	·74	80	5·90
15	1·12	85	6·27
20	1·48	90	6·64
25	1·84		
30	2·21		

Various Useful Data.

To reduce specific gravity with regard to air, to specific gravity with regard to hydrogen, multiply by 14·438.

To reduce specific gravity with regard to hydrogen, to specific gravity compared to air, multiply by ·06926.

To reduce weight in air to weight in vacuo:

P=weight required in vacuo.
q=weight in air.
V=volume of body weighed.
v=volume of the weights.
s=specific gravity of air (weight of one cubic unit).

$$P = q \times s\ (V - v).$$

To find the circumference of a circle:

a=circumference. r=diameter.
n=3·1415926. a=n r.

To find contents of a sphere=c:

$c = d^3 \times ·5236$. d=diameter.

To find contents of a cylinder=c:

c=area of base, × height.

To find the contents of a rectangular vessel=c:

a=length. h=height.
b=breadth. $c = a \times b \times h$.

To convert the degrees of Twaddle's hydrometer into specific gravity, multiply by 5, and add 1000; this gives the specific gravity with reference to water as 1000.

To convert lbs. per square inch into kilograms per square centimetre, multiply by ·0703.

To convert kilograms per square centimetre into lbs. per square inch multiply by 14·2247.

To reduce inches to metres, multiply by ·02540.

To reduce inches to centimetres, multiply by 2·540.

To reduce centimetres to inches, multiply by ·3937.
To reduce kilograms to pounds, multiply by 2·2046.
To reduce litres to gallons, multiply by ·22.
To reduce gallons to litres, multiply by 4·548.
To reduce pints to cubic centimetres, multiply by 567·936.
To reduce grams to grains, multiply by 15·432.
To reduce grains to grams, multiply by ·0648.
To reduce ounces to grams, multiply by 28·349.
The following data are useful in calculations relating to air:
To find the quantity of nitrogen by volume corresponding to 1 volume of oxygen, multiply by 3·770992.
To find the quantity of oxygen by volume corresponding to 1 volume of nitrogen, multiply by ·265182.
To find the quantity of nitrogen by weight corresponding to 1 part by weight of oxygen, multiply by 3·313022.
To find the quantity of oxygen by weight corresponding to 1 part by weight of nitrogen, multiply by ·301839.
To find the quantity of nitrogen by volume corresponding to 1 part by weight of oxygen, multiply by 2·6365411.
To find the quantity of oxygen by volume corresponding to 1 part by weight of nitrogen, multiply by ·2730071.
To find the quantity of nitrogen by weight corresponding to 1 part by volume of oxygen, multiply by 3·6629154.
To find the quantity of oxygen by weight corresponding to 1 part by volume of nitrogen, multiply by ·3792848.

Weights and Measures of Imperial System.

Measures of Mass.

1 grain	gr.	
1 ounce (avoir.)	oz.	=437·5 grains.
1 pound	lb.	=16 ounces= 7000 „

Measures of Capacity.

1 minim	min.	
1 fluid drachm	fl. drm.	=60 minims.
1 fluid ounce	fl. oz.	= 8 fluid drachms.
1 pint	O	=20 fluid ounces.
1 gallon	C	= 8 pints.

Measures of Length.

1 inch	in.	
1 foot	ft.	=12 inches.
1 yard	yd.	=36 „

Relation of Volume to Mass.

1 minim	is the volume at 62° F. of	0·9114583	grain	of water.
1 fluid drachm	„ „	54·6875	grains	„
1 fluid ounce	„ 1 ounce or	437·5	„	„
1 pint	„ 1·25 pounds or	8750·0	„	„
1 gallon	„ 10 pounds or	70000·0	„	„
109·7143 minims[1]	=the volume at 62° F. of	100	„	„

[1] Taken as 110 minims throughout the Pharmacopœia.

Weights and Measures of Metric System.

Measures of Mass.

1 milligramme=the thousandth part of one grm. or 0·001 grm.
1 centigramme=the hundredth part of one grm. or 0·01 grm.
1 decigramme =the tenth part of one grm. or 0·1 grm.
1 gramme =weight of one millilitre of distilled water at 4° C. (39·2° F.) or 1·0 grm.
1 dekagramme=ten grammes or 10·0 grm.
1 hectogramme=one hundred grammes or 100·0 grm.
1 kilogramme =one thousand grammes or 1000·0 grm.

Measures of Capacity.

1 millilitre=the volume at 4° C. of 1 grm. of water.
1 centilitre= „ „ of 10 „
1 decilitre = „ „ of 100 „
1 litre = „ „ of 1000 grm. (1 kilog.).

Measures of Length.

1 millimetre=one thousandth part of one metre or 0·001 metre.
1 centimetre=one hundredth „ „ or 0·01 „
1 decimetre =one tenth „ „ or 0·1 „
1 metre 1·0 „

Relation of Cubic Measures to Measures of Capacity.

1 cubic centimetre=0·99984 millilitre.
1 cubic decimetre =0·99984 litre, or 1000 cub. centim.

1·00016 cubic centimetres=1 millilitre.
1·00016 cubic decimetres =1 litre, or 1000 millilitres.

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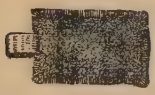

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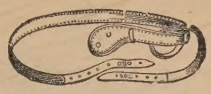

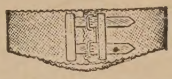

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